# Gas Journal

JUNE 17, 1936

Vol. 214 88th Year No. 3813

# Editorial Notes

## Coal

THE wisdom of the Government in having withdrawn the ill-conditioned Coal Mines Bill becomes increasingly apparent. It is obvious that at the time the Bill was introduced it had not been fully considered by any of the great interests affected, and the early date fixed for its second reading allowed no sufficient time for the inevitable consequences of the Bill to be adequately appreciated by Members of Parliament, and still less by the public at large.

A time for reflection was therefore essential, and it is satisfactory to realize the extent to which the great consuming public is awakening to the dangers which are inherent in the system of a coal monopoly. The attitude of the public is well expressed in the leading article of *The Times* of June 9 on colliery amalgamations—"If Parliament is saving the industry from self-destruction, it must also save the community from exploitation."

When the redrafted Bill is introduced into Parliament after the summer, it is, therefore, to be hoped that it will contain adequate safeguards for the consumer against any arbitrary exercise of monopolistic powers. Public utilities ask no more than that some of the obligations under which they themselves work should be applied to the coal industry—that, for example, there should be an obligation to supply coal of the quantity and quality required; that contracts should be equitable in their terms without unfair discrimination as between one class of consumer and another. It would be difficult to ensure the observation of these reasonable requirements unless the existing Committees of Investigation were superseded by a judicial and impartial tribunal whose sole function would be to hold the scale fairly between the supplier and the consumer.

It is appreciated that these demands will probably require an amendment of the Coal Mines Act, 1930, and that no such amendment is possible until the introduction of the Government Bill in the autumn. This interval will be fully occupied by negotiation, and it is satisfactory to know that the coalowners are this week to meet representatives of the Conjoint Conference of Public Utility Associations for a preliminary survey of the points at issue. Meanwhile, the draft of the Central Coal Mines Scheme (Amendment) Order has now been issued, and it is clear that this Scheme will put the finishing touches upon the monopoly, which is based upon the District Schemes at present awaiting the approbation of Parliament. It is obvious that district central buying and selling organizations would be ineffective if competition between the various districts was permitted. The object of the draft Central Scheme is, therefore, to eliminate inter-district competition, and enable the Central Coal Council to act upon its own initiative, and not, as formerly, merely upon the requests of the districts.

The Central Scheme, as drafted, will enable the Central Council to consider the operation of the district schemes and, with a view to co-ordinating the operation of those schemes, to issue to the Executive Boards directions relating to the regulation under the respective district schemes of the terms and conditions of the sale or supply of coal produced in their district. It is clear, fortunately, that the draft Central and District Orders will not be allowed to pass the Houses of Parliament without discussion and opposition, and a large number of Members have already indicated their intention of calling attention to the fact that the Orders contain no protection whatever for the consumer. There are few Parliamentary constituencies that do not contain a gas undertaking, and if each gas undertaking ensures that its local Member of Parliament appreciates the situation, there can be little doubt that the just demands of the Industry will ultimately be granted.

## Air Raid Warning

WRITING not long ago in these columns on the subject of national defence, and the plans enunciated by the Government for strengthening our resources in the cause of the preservation of world peace, we stated that the wholehearted support of the Gas Industry could be relied upon as a matter of course. At the same time we looked to the Government to give full recognition to what the working of our Industry means to national security. We said, in effect, that we as an Industry are not only willing, but more ready and able than many others, to assist in implementing in many highly important ways the Defence plans of the Government. During the past few years our Industry has organized and equipped itself for a national service greater than ever before. While nothing would be further from our thoughts than to suggest using what may be described as a national emergency for the purpose of embarrassing the powers that be, or bringing pressure of any kind to bear upon them, we did seriously suggest that the greater the recognition of our Industry as a foremost national asset, the better we should be able to carry out our part in the scheme of

things which is before the nation. We should in any case do our best; we look for help and encouragement from high places.

In these days, national defence unfortunately involves a consideration of methods of protecting the civilian population, as well as our cities, factories, and other assets against air raid, and in this connection the question of public lighting has inevitably, and for obvious reasons, come to the fore. It is, in fact, at the moment under discussion in the proper quarters, and it is a question which, of course, is of close concern to our Industry. It appears that there is no authoritative lead on the matter, that the Government have not yet even satisfied themselves what precautions are desirable in the interests of safety. At the same time, public lighting authorities are, we understand, being asked in the course of investigation how quickly they could extinguish their lighting system, should this be necessary, on the report of an approaching attack from the air.

It appears that our competitors the electricians are seizing upon this as an opportunity for a hit against gas, and in certain instances are endeavouring to persuade local authorities and public lighting engineers that, without any fuss or bother, the whole of an electric lighting system could in such an event be cut off immediately. As a matter of fact, this is by no means such a simple affair as the electricians would have local authorities believe; and it takes little imagination to picture what would happen if all electricity supply were suddenly cut off at the source at a moment when complete absence of panic would be more helpful to the authorities than anything else in the world.

What is more to the point, however, local authorities are being led to assume by the electricians that, with gas for street lighting, a considerable period of time must elapse between the report of an air raid alarm and all the public lamps being extinguished. This suggestion must be strenuously resisted by the Gas Industry. Should it become essential to have simultaneous and immediate extinction of public lighting our Industry could fulfil this requirement. We are able to state that for some time developments have been taking place in the perfection of suitable " air raid valves " for incorporation—again should it be deemed desirable by the Government—in public gas lamps. Local authorities can rest assured that, from a safety point of view in the event of air attack, public lighting by gas is in no way inferior to public lighting by electricity.

It would clearly be nothing but a grave national disservice if the Gas Industry, at a time when, as we have pointed out, it can be of greater service than ever before, were to be weakened by the wholesale and totally unnecessary displacement of gas public lighting under panic measures, and we look for the most careful investigation of the claims which may be made by the rival system in this respect, and of suggestions which our Industry can make on the subject. And once again we can assure the individual gas undertaking that every possible step is being taken by the plant manufacturers to meet the situation.

## Tar as Road Material

At the International Road Tar Conference held at Gleneagles on June 11 three interesting Papers were presented dealing with different aspects of the use of tar for road making and maintenance and suggesting likely directions to pursue to increase the popularity of tar for this purpose. One of the contributions was by Mr. W. J. Hadfield, Sheffield City Engineer, who stressed the importance of the closest possible co-operation between the manufacturer of the tar and the man responsible for road construction and upkeep. There is, of course, no doubt that only in such a way can success be expected. Lack of collaboration in the early days of the development of tar as a material for roads in many cases produced results which to say the least were disappointing. As to the suitability of tar, however, Mr. Hadfield was able to point to a tarmacadam road laid in Sheffield more than forty years ago. When that road was laid it carried only a small quantity of traffic, but by 1935 it was carrying 7,150 tons a day. The lower coats have never been repaired, but from time to time openings have been made, perhaps for a gas main or similar purpose, and it has been proved that the tar has not lost its viscosity. Under the traffic during the last ten years the cost of maintenance has worked out at only 2d. per square yard per annum. To-day the road is in good condition and carries the traffic comfortably. In Sheffield there are many miles of tarmacadam roadway more than 20 years old and which carry heavy traffic. A couple of years ago a piece of the tarmacadam from one of these old roads was examined, and it was shown that no " drying " out " of the tar had occurred. Millions of super yards of tarmacadam are being laid out each year at a cost which makes this form of construction the cheapest of any, excepting water bound macadam, which is now laid only on roads with little traffic.

Another Paper at the Conference was by M. A. Léauté, of Paris, who discussed the capillary action of tars in road surfaces. The Author has carried out a great deal of work in this connection, and he links up his investigations with the phenomenon of " sweating." Often the binder, at first well below the upper faces of the chippings, in course of time tends to cover these chippings and result in a polished surface. The phenomenon, he points out, has frequently been attributed to the forcing of the chippings into the underlayer, the latter having been softened by heat in the summer. It cannot be disputed, he observes, that this burying of the chippings, if it takes place, assists the binder to rise. But his work has shown that the binder appeared on the surface of two chippings of cubic shape when these were sufficiently close together, even if the underlayer remained rigid and cold. He draws the conclusion that capillary rise is the predominant cause of sweating. He goes on to state that examination of tars by the capillary tube method he has evolved may be looked upon as a means for securing, by a single test, the greatest amount of useful information concerning the employment of a binder. At the same time the method enables one to follow the combined part played by surface tension, viscosity, and volatility in the phenomenon of sweating—a matter of such great importance from the point of view of maintaining the roughness of road surfaces.

## An Interesting Suggestion

The third Paper, by Herr Von H. Reiners, of Berlin, was on the suitability of tar for roads carrying high-speed traffic and for automobile tracks. The Author is Manager of the " Avus," an international racing track near Berlin; and on this track new methods of road construction have been developed under careful supervision. In this Paper a new method of constructing tarmacadam roads is described, consisting of mechanical ramming on the pile-driving principle. The method of tar road construction applied for the first time on the " Avus," Herr Reiners maintains, deserves special consideration if it is desired that such construction should keep pace with other methods of building high-speed traffic roads. He grants that other types of tar roads have stood equally well under other conditions, and are worthy of an equal amount of attention. What is really of prime import-

ance is that gradually certain methods should be chosen from the aboundance of existing modes of construction for application to particular purposes, and should be brought to the highest degree of perfection. There is, however, the Author suggests, another line which should be considered—the manufacture of moulded tar bricks. The great advantages possessed by a form of road-surfacing which can be produced mechanically in the factory are obvious. Under continuous supervision, independent of weather conditions, such bricks moulded under uniform conditions of production would, if of proper shape and suitably laid on a reliable foundation, give promise of a long life and faultless behaviour as a road surface.

## Furnace Atmospheres

At their last meeting the North of England Gas Managers' Association had the privilege of hearing a Lecture by Professor J. W. Cobb on "Furnace Atmospheres and their Effects." The work which has been carried out on this subject in recent years, part of which has been undertaken at Leeds University, has greatly extended the possibilities of gas for the heat treatment of metals, both ferrous and non-ferrous. Professor Cobb's Lecture, which is published on later pages of our issue to-day, was devoted to consideration of the effects of products of combustion on the scaling of steel, and at the outset it is pointed out that, taking the year 1929, when the production of steel was round about 9,500,000 tons with an average price of £8 per ton, every 1% loss of metal by scaling would mean a loss of £760,000. Nor is this direct loss necessarily the most serious. Machining costs have to be considered, and in some cases scaling may mean the production of a "waster."

Professor Cobb then outlines the laboratory investigation conducted at Leeds University on the effects of different atmospheres on the production of scale, and gives the conclusions drawn from the many tests made. He explains that "neutral" atmospheres containing nitrogen, steam, and carbon dioxide are only neutral in the sense of containing no excess of oxygen or combustible gas. They are not inert to metal. The tests show that the best results as regards freedom from scaling will only be obtained from a furnace so designed, constructed, and controlled in use that an atmosphere containing no free oxygen and a minimum of steam can be consistently maintained. Although by the exclusion of oxygen and the use of reducing gases such as hydrogen, carbon monoxide, and methane scaling can be very much reduced, complete elimination of scaling can only be brought about efficiently by indirect heating, in which the bulk of the products of combustion does not come into contact with the metal. Regarding the effect on scaling of the sulphur content of the fuel, the results indicate that, though free oxygen is a strong scaling agent, sulphur dioxide is very much more powerful. However, with a normal purified town gas the results are substantially the same as those obtained from an atmosphere made up without any sulphur at all. Apart from scaling, Professor Cobb points out, the question of sulphur fixation in the metal must be considered.

From Professor Cobb's Lecture it is interesting to turn to the remarks made by Dr. A. Fells, of the Sheffield Gas Company, during the discussion on the Paper by Mr. T. H. Pardoe at the recent Institution Meeting. These remarks were concerned with furnace atmospheres in connection with the bright annealing of non-ferrous metals—a subject to which a great deal of attention has been paid by the Sheffield Gas Company and which at the moment is the concern of a Technical Sub-Committee of the Joint Co-ordinating Committee. Dr. Fells suggested that in the past the problem of prevention of surface damage to metals, generally referred to as atmosphere control, has been made to appear like some form of magic. Regarding the sulphur content of the purging gases used to prevent metal surface damage, it is, he said, almost universally believed that such purging gases must be as free from sulphur as possible, and nearly all atmosphere control processes on the market for use with non-ferrous metals have been designed to give this freedom from sulphur. The makers of electric furnaces insist on this freedom not for the sake of the metal being treated, but because sulphur would damage the heating elements of the furnace. Many non-ferrous metals, Dr. Fells maintains, can be perfectly bright annealed in the products of complete combustion of a normal town gas without any sulphur being removed; and as there is no need to condense the water vapour content of the products of combustion ordinary in-flame type gas heated furnaces of simple form can be employed. As a matter of fact they have been used successfully in Sheffield for the past three years. With town gas as fuel, he emphasized, the cost of bright annealing such metals as copper, gun-metal, cupro-nickel, standard silver, and phosphor bronze is confined to the cost of heating the metals. No costly external supply of dry sulphur-free purging gases is required. Town gas can provide the heat and the desired control of atmosphere for the bright annealing of many non-ferrous metals at one and the same time. Dr. Fells put in a plea that furnace makers should realize this and market furnaces of the simple open type.

## A Paying Proposition

The case for the adoption of town gas as the medium for heating swimming pools and public baths is admirably presented in the latest publication of the British Commercial Gas Association dealing with industrial uses of gas. The lay-out is good, the illustrations are excellent, and the information brief and very much to the point. The information will, we suggest, come as something of an eye-opener to many councillors, into whose hands the Gas Industry should see that the publication is placed. The heating of open-air swimming pools is a recent development which has done more than anything else to advance their popularity; and gas is a particularly suitable fuel for the purpose. In the many photographs of both municipal and privately owned swimming pools in the B.C.G.A. publication there is no case in which the boiler house can be seen. There is, in fact, nothing to show there is a heating installation. The heating is carried out automatically and with the utmost cleanliness. The same applies to the central heating of the dressing room accommodation. With indoor baths—and gas is being used to an increasing extent for indoor as well as outdoor bathing—central heating of the building is very important, particularly, of course, in the winter. Adequate air temperatures in indoor baths are rapidly reflected in attendance figures.

The point we would emphasize is that the use of gas for heating is a proposition which pays the proprietors of swimming pools and baths very handsomely indeed. Let us quote the Stonehaven municipal open-air swimming pool as an example. This pool has a capacity of 320,000 gallons of sea water, and the gas heater a capacity of 1,200,000 B.Th.U. per hour. The effect of heating on attendance is shown by the figures before and after the gas installation was put in. The seasonal attendance went up by 90% in the case of adult bathers, 70% in the case of juvenile bathers, and 80% in the case of season ticket holders. Gas is the obvious fuel for heating the water for swimming pools and baths; and the publication of the B.C.G.A. should prove exceedingly useful to local

authorities, owners of unheated or unsatisfactorily heated pools, and hotel and country club proprietors contemplating this useful addition to the amenities of their establishments.

## Chemical Engineering Congress

THE stage is set for the Chemical Engineering Congress of the World Power Conference, which is to take place in London next week. We learn that, of the 1,000 delegates who will attend, 300 will be from overseas, representing no fewer than 45 countries. The largest overseas delegation, numbering 100, comes from the United States of America, Germany has a representation of 50, Japan 30, and the U.S.S.R. 15. There is also a goodly force from Australia, South Africa, and Canada. Under the Presidency of Lord Leverhulme, the Congress will be opened on Monday next by the Duke of Kent. There will be a Government reception, and at the official banquet the speakers will be Lord Rutherford, Mr. Ramsay Macdonald, Mr. F. M. Bruce, High Commissioner for Australia, and Sir David Milne-Watson, who, as we have already announced in the "JOURNAL," is Chairman of the Organizing Committee. At the business sessions 121 Papers are to be presented, and the 30 alternative visits to works offer a wide choice. Among the places to be inspected are the Fulham Works of the Gas Light and Coke Company, the Chemical Works of the South Metropolitan Gas Company, and the Fuel Research Station. It is fitting that in the Congress the Gas Industry is to play a prominent part. Apart from the usefulness of the Papers and the formal discussions, however, not the least valuable feature of a Congress such as this is that it provides an opportunity for workers in the same fields but in different countries to make contact in a common cause.

## A Doubtful Remedy

INASMUCH as everyone deplores the present-day dangerous condition of our thoroughfares by night—as well as during the hours of daylight—anything promising greater security (or perhaps it might be more appropriate to say a lessening of insecurity) to life and limb, so far as hapless pedestrians are concerned, would be assured of a more than sympathetic welcome. But a "proposal" and a "promise," though they may be accepted as having much the same meaning when cited in connection with a certain kind of case in the Law Courts, are in no way necessarily synonymous terms when applied to suggestions for increasing the safety of the roads.

For example, we do not think a proposal lately put forward in the correspondence columns of the *Financial Times* can be accepted as holding out great promise in the prevention of accidents. The writer of the letter seems disappointed that, "for some reason that has never been made quite clear, the Minister of Transport has always discouraged illuminated globes for Belisha beacons," with the result "that the new crossings become dangerously invisible after dark." He goes on to say that "it would help greatly towards safety if, in poorly lit districts, the orange beacons had an internal light." So far, we find ourselves in entire agreement, and we would emphasize the fact that the absolute reliability of gas renders it eminently suitable for the lighting of traffic direction posts and signs. One of the cities in which gas is extensively utilized for this purpose is Manchester, where there are two types of illuminated bollard in use. In Southport, also, gas-illuminated traffic guard-posts have been erected for the safeguarding of pedestrians in busy areas.

Where we part company from the correspondent from whose letters we have been quoting is when he goes on to urge that "a still better plan would be to place one of the modern electric discharge lamps at each Belisha crossing." It might be that this would show up the beacons and "enable the motor driver to see in ample time whether any pedestrian was crossing or preparing to cross," but we are inclined to doubt the latter claim. By this time the incomparable advantages of uniform street illumination are fairly generally understood, and from the motorist's point of view the placing of powerful electric lights specially in the vicinity of road crossings would hardly be hailed as a boon. Rather let us continue to strive for that sufficiency of even and efficient illumination which gas is so well able to supply, if only the responsible public authorities will ask for it.

## Personal

The Wallasey Gas Committee has appointed Mr. WALTER THORP HAINSWORTH to the position of technical assistant in the Gas Department.

## Obituary

Mr. GEORGE TINDLE READHEAD, a South Shields shipowner and a Director of the South Shields Gas Company, has died, aged 58.

* * *

It is with regret that we record the death, on June 11, of Mr. HENRY LEWIS PHIPPS ALLENDER at his residence, 21, Russell Hill Road, Purley, Surrey.

Mr. Allender, who was 69 years old, joined the firm of Stevens & Co., Proprietors of the Torbay Paint Company, on Jan. 11, 1882, as junior clerk, rose to be Manager, and succeeded Mr. Freeman Burrows, on his death in 1913, as partner in the firm. When the Torbay Paint Company, Ltd., was formed in 1926, he was appointed a Director and Secretary, and held the position of Director until he retired in 1935, following an illness which had started during the week of the Institution Meeting in 1934.

Mr. Allender's loss will be felt by many of his old friends in the Gas Industry with whom he was associated for many years. The interment took place at Bandon Hill Cemetery on Monday.

* * *

The death occurred suddenly on June 11 of Bailie JOHN YOUNG, Convener of the Gas Committee of Glasgow Town Council. He had been a member of the Council since 1928, was formerly a member of the old Parish Council, and sat on the National Executive of the Steelworkers' Union. He had been a magistrate for three years.

* * *

The death occurred, on June 4, of Dr. R. WIGGINTON, Lecturer in the Department of Fuel Technology of Sheffield University, following an operation for appendicitis. Dr. Wigginton was a native of Streatham, London, and went from Acton County School to Imperial College, South Kensington, where he took his B.Sc. with first class honours in Chemistry in 1920. In the same year he was appointed demonstrator and later lecturer in the Department of Fuel Technology of Sheffield University, a post he held at his death. During the War he was a chemist in the Royal Engineers, concerned with the control of water supplies in Mesopotamia. In 1933 he was awarded the degree of Doctor of Philosophy of Sheffield University for a research on the combustion of carbon. Dr. Wigginton was well-known to producers and users of fuel for his "Notes on Recent Developments in Fuel Technology," a monthly feature of the journal *Fuel in Science and Practice* since 1923. He was joint author (with A. E. Findley) of "The Practical Chemistry of Coal and its Products," published in 1921, and sole author of "Coal Carbonization," published in 1929. He was the author of numerous Papers, including several on "Resins in Coal," of which he made a particular study. Although he was of a reserved disposition, all who came in contact with him were impressed with his encyclopædic knowledge and his ability to impart it. He was an Associate Member of the Institute of Mining Engineers and a member of the Coal Research Club. Dr. Wigginton was 39, and leaves a widow and a son.

# CORRESPONDENCE

## *Gas Safety Precautions*

SIR,—I am sorry that Mr. W. J. Smith, as Secretary of the National Gas Council, has been put to the trouble of correcting, in your issue of 10th inst., a sentence in my remarks on Mr. C. A. Masterman's Paper on "Gas Safety Precautions." In endeavouring to condense my remarks I omitted a few words which were in my rough notes, and have been added to the proof which I have revised for the Institution's Transactions. The sentence thus revised reads as follows: "I recommended that the Gas Industry should of its own accord, if it would without compulsion, institute arrangements for the elimination of unsafe gas appliances and for the periodical inspection and maintenance of piping and apparatus on consumers' premises."

This remark was intended to paraphrase briefly four recommendations, of which Mr. W. J. Smith quotes only two, neither of which speaks of the elimination of unsafe gas appliances. In each recommendation I left the initiative to the Gas Industry, whose suggestions were to form the basis of whatever compulsory measures might follow. I regret that in paraphrasing in one sentence four rather long recommendations I disregarded the fact, when speaking, that in one of them I had proposed that the Board of Trade should require that all gas undertakings specified by them should adopt a scheme, based initially on suggestions from the Gas Industry, for the inspection of consumers' fittings, &c. I was probably influenced by the knowledge that my study of Press reports of inquests prior to 1924 had led me to the conclusion that the "black list" of undertakings on which this requirement would need to be enforced was a very short one.

The purpose of my remarks on Mr. Masterman's Paper was to express gratification at the reduction in the number of accidental deaths due to defective appliances, &c., which had ensued under the policy of Gas Safety Precautions which he advocated, and to point out how greatly he had diverged from the views expressed by the National Gas Council in 1924—viz., "The Council submit that there are no grounds for the suggestion that a material reduction in accidents would have been effected in the past and could be effected in the future by any system of selection, inspection, and maintenance of the pipes, fittings, and appliances installed or to be installed in consumers' premises."

It will be observed that it is not a compulsory system, but *any* system of selection, inspection, &c., of fittings, which the National Gas Council in 1924 regarded as futile in reducing accidents.

I cannot refrain in conclusion from drawing attention to the reports in the daily Press, only a few days after Mr. Masterman presented his Paper, of an inquest at Hendon in which a gas-tap without a stop figured. There were stated by the representative of the gas undertaking (which was not Mr. Masterman's Company) to be still many hundreds of such taps in existence, and if that be true I think the National Gas Council should consider whether the recommendations in my Report of 1924, and Mr. Masterman's Gas Safety Precautions, cannot be brought into play universally to prevent the injury which the Gas Industry as a whole suffers from the reports of accidental deaths from gas poisoning caused by defective taps and fittings.

I am not unmindful of the facts that, while accidental deaths from gas poisoning are not increasing, those from electricity supply are increasing in numbers, but the Gas Industry should not on this account fail to adopt generally the Gas Safety Precautions which Mr. Masterman has so ably advocated.

Yours, &c.,
W. J. A. BUTTERFIELD.

66, *Victoria Street,*
*Westminster, S.W.* 1.
*June* 15, 1936.

## *Contamination of Gasholder Water*

SIR,—At the Autumn Meeting of The Institution of Gas Engineers, a joint contribution was made by the Gas Light and Coke Company, Ltd., and the South Metropolitan Gas Company on the contamination of gasholder water with sulphuretted hydrogen. I read this communication with great interest, as for some time we had suspected similar troubles, and they have recently become serious.

During our summer here, which has just ended, the trouble has become more pronounced and we are getting a definite sulphuretted hydrogen test on the gas leaving the holder continuously. We were very interested in the matter and commenced a systematic investigation. Analyses show that the gasholder water contained less than 1 grain of sulphate per gallon, so that according to the information contained in the Institution Paper, that should be quite harmless. Furthermore, it rather threw doubt upon the idea that sulphates in the water were the source from which bacteria were gathering the material for the manufacture of sulphuretted hydrogen.

However, I think that careful consideration of the conditions existing in a gasholder tank, and of the conditions necessary for bacterial life, rules out the possibility of bacteria in gasholder tank converting sulphates into sulphuretted hydrogen. Bacteria must get energy from somewhere if they are to live and be active. They must get it either from chemical reaction which they carry on in themselves—that is exothermic chemical action—or else they must be able to get energy from direct sunlight. They cannot get energy from the latter source inside a gasholder tank, and the conversion of a sulphate, which is the ultimate oxidation product of sulphur, to sulphuretted hydrogen must be strongly endothermic.

It appears, therefore, that the source of the sulphur from which the bacteria manufacture sulphuretted hydrogen in the gasholder is more likely to be found in the sulphur compounds dissolved in the holder water from the gas.

Unfortunately, there is very little published information regarding bacteria which generate sulphuretted hydrogen. The only book which we have been able to obtain dealing with what are known as sulphur bacteria describes bacteria which live on sulphuretted hydrogen and either produce sulphates or accumulate what are known as sulphur globules in themselves.

We have satisfied ourselves that there are anaerobic bacteria in the water, though we have not yet had the opportunity of investigating these organisms thoroughly, but it does appear to us that it is a line of research which should be followed up vigorously.

Experiments in regard to aeration of contaminated water as suggested in the Institution Paper has satisfied us that this method can be effective in the elimination of sulphuretted hydrogen, but a definite time is required for this to take place after the water has been thoroughly aerated. Under our conditions we find that at the end of six hours the aerated water is free from sulphuretted hydrogen, even when it has been stored in a dark bottle. However, the aeration of 3½ million gallons of water is not a small job, and if it becomes necessary to do this periodically, it means a considerable expense.

I should like to urge, therefore, that this question should be made the subject of intensive research, particularly as regards the bacteriological side of the question. Our own bacteriological investigations are giving rather intriguing results, and I hope to have further information available shortly.

Yours, &c.,
F. W. J. BELTON.

*Christchurch Gas, Coal and*
*Coke Company, Ltd.,*
*Christchurch, N.Z.*
*May* 27, 1936.

## Home Service Bureau at Smethwick

### Inauguration by Mayoress

Last week the Mayoress of Smethwick (Mrs. Leslie Jones) inaugurated the Home Service Bureau and Model Kitchen which the Gas Committee has established at the Showrooms in High Street. Alderman Samuel Smith, Chairman of the Committee, presided, and among those present, in addition to the Mayor, Alderman E. Hewitson, were Mr. E. Hardiker (Gas Engineer and Manager), Mr. J. H. Davis (Secretary), and Mr. Cullington (Sales Manager).

In expressing the pleasure she had in assisting to inaugurate the Bureau, the Mayoress said that the Gas Department had shown enterprise in the appointment of a qualified demonstrator whose services were available to consumers. The additional facilities would be very acceptable to the housewives in the Borough.

# News in Brief

**Thirty-one Tenants** of the Mossbeath Housing Scheme are petitioning Cowdenbeath Town Council to substitute gas for electricity.

**The Society of Chemical Industry** will hold its Annual Meeting in Liverpool from July 6 to 10, under the Presidency of Mr. W. A. S. Calder.

**Ceramic Society.**—Meetings of the Refractory Materials and Building Materials Sections of the Society will be held in London on Monday next, June 22.

**The Blackburn Corporation Gas Department** have an excellent stand at the Great Industrial Exhibition, opened at Blackburn on June 10 by the Earl of Derby.

**Alnwick Town Council** discussed for several hours the relative merits of the rival demonstration schemes of gas and electricity street lighting, to which we referred last week, and finally decided to take a vote of the ratepayers on the question.

**Denny Town Council** has reduced the price of gas by 2½d. per thousand cu.ft., and at a meeting of the Council, Mr. R. M. Simpson, the Gas Engineer, was congratulated by Provost Loney on having brought down the cost by a half since his appointment seven years ago.

**The Possibility of Selling their Gas Undertaking** is under consideration by the Conway Town Council, who decided at a recent meeting that enquiries be set on foot in regard to potential purchasers, having obtained the approval of the Government Department concerned.

**Wigan Gas Department** will be called upon to pay an additional £4,000 for coal during the coming year, but they do not anticipate any increase in the price of gas to consumers unless something unforeseen happens. This year the Department will hand over to the Renewals Fund a net amount of £9,000.

**Applications are Invited** for the William Cartwright Holmes Scholarship and the Corbet Woodall Scholarship. Both these Scholarships are tenable at Leeds University, the former having a value of £120 a year, the latter one of £60 a year. Full particulars will be found in our advertisement columns to-day.

**Nemlin Chemicals, Ltd.**, chemical manufacturers and distillers, of Bradley Fold, near Bolton, have taken over the Bury Corporation's tar distillery at Elton, where it is proposed to manufacture road materials, bitumen, paint, and varnishes. The firm has contracted to take the output of tar of the Bury Gas Department for a long period. Alterations and extensions are now in progress and many thousands of pounds will be spent on new plant.

**The Purchase of the Frome Gas Company** is the chief provision of a Special Order for which the Bath Gas Company are intending to apply to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934. The Order also seeks to prohibit the British Gas Light Company from exercising in so much of the parish of Southwick in the rural district of Warminster and Westbury as is included in the Bath Company's thus added limits any of the powers conferred on them in respect of their undertaking under the Trowbridge Gas Orders, 1880 to 1925.

"**Your Obedient Servant Gas**" was the striking slogan of the South Suburban Gas Company's display which took part in the Bromley (Kent) Carnival last week. The Company arranged an attractive display on their decorated lorry, one side representing a kitchen and the other a bathroom. In front was an ingenious model representing a combined garage and greenhouse, with gas heating, of course—a novel idea this for the small property owner. The whole display showed in a convincing way how many purposes gas can now serve in the modern home.

**To Investigate** the cause of a leakage in one of the tanks at Dunfermline Corporation Gas-Works, the services of a diver have been secured. The leak, which has existed for two years, is a small one, but it has necessitated the pumping back of leakage water. At a recent meeting the Gas Manager stated that to empty the tank would involve putting the holder out of commission for from four to five weeks, and the loss of nearly 2½ million gallons of water. To avoid this he had obtained the services of a diver from Metal Industries, Ltd., Rosyth, to enter the tank to investigate and, if possible, to carry out repairs.

**The New Gas Showrooms at Barnsley**, as mentioned in our description last week, incorporate a broad sign displaying an appropriate slogan, and floodlighted from above by seven strip lanterns. We now learn that these lanterns are of the "Avil" type supplied by Messrs. Foster & Pullen, Ltd., who also supplied for the entrance a ceiling light in "Staybrite" steel.

**After Sixty Years' Service** with the firm, Mr. Joseph Richards has recently retired from the service of the Cannon Iron Foundries, Ltd., of Bilston, and has been presented with an illuminated address, a gold watch, and a solid silver salver by the Directors of the Company. Mr. Richards' three brothers and two sons, in addition to himself, have a record of 296 years' service with the firm.

**Whether the New Town Hall** of Sale Corporation shall be heated by gas or by coke is still under discussion. A committee of the Council decided that gas should be used, but the Ministry of Health instructed the Corporation to get expert opinion and forward a report. The report shows that coke would cost £200 a year less than gas. Our local correspondent is informed by a councillor that the Council has decided to call the expert before a full meeting to ascertain why gas is so much dearer. "It seems evident," he said, "that the Ministry of Health will not sanction the dearer heating, and this may compel us to use the cheaper commodity."

**The Irish Free State Minister** for Industry and Commerce has made an order excluding from the operations of certain sections of the new Conditions of Employment Act all workers connected with the laying, maintenance, repair, and renewal of main and service pipes for the supply of gas and the repair and renewal of meters, stoves, and other gas apparatus. In all these cases work may be carried on by adults outside the hours laid down in the Act. Adult workers may also work on these forms of industrial work on Sundays and public holidays. In every case, however, apart from overtime, no worker shall be employed for more than nine hours in any day or 48 hours in any week.

**Mr. J. Sandon Stubbs**, of the Liverpool Gas Company, in an address to the Bootle Rotary Club, said: "Gas is used to-day in more than 3,000 trades, with an average of seven processes in each trade. In the city of Liverpool gas is extensively used for non-ferrous metal melting, tinplating, and solder baths, furnace heating in connection with the annealing of chains, carburizing and hardening, and also for tempering and sterilization of milk bottles, while the oxy-coal-gas cutter, which cuts steel and iron as if it were paper, has a wide use. In Liverpool alone the gas used for biscuit making is greater in quantity than the whole amount of gas now used in towns like Aberystwyth, Ilfracombe, and Runcorn."

**Under the New Conditions of Employment Act** now in operation in the Irish Free State all employees in gas undertakings must receive an annual holiday of at least a week with full pay and six public holidays also with full pay. The Act provides for a 48 hour week for adults and a 40 hour week for persons under 18. Young persons cannot start work before eight o'clock, and no one under 14 can be employed at industrial work under any circumstances. A licence from the Government is now necessary for shift work, and considerable restriction is placed on overtime. No worker, with certain exceptions, can work on Sundays or church holidays. For the first time workers were entitled to be paid in respect of Whit Monday, the first of the public holidays mentioned in the Act.

**Gas and Public Authorities** is the title of the latest addition of the B.C.G.A.'s "A Thousand and One Uses for Gas." The booklet relies not on letter-press, but on a number of excellent illustrations of actual installations to tell its story. And a very convincing story it is—housing and slum clearance, public lighting, central heating and cooking in public buildings, the equipment of hospitals and clinics, educational establishments, swimming baths and other premises devoted to recreation, crematoria, municipal airports—all these are dealt with in the booklet briefly but cogently. Among the installations illustrated are the House of Commons (large-scale cooking), Belfast City Hall (central heating), the Wythenshawe Estate, St. Bartholomew's Hospital, Central London's street lighting system, Southampton Municipal Crematorium, and Southend-on-Sea Municipal Airport.

## Amalgamation and Grouping

*Gas Consolidation, Ltd., Expansion.*

Gas Consolidation, Ltd., proposes to increase its capital from £500,000 to £1,250,000 with a view to extending its interests and activities.

An Extraordinary General Meeting has been called for Tuesday, June 30, at which shareholders will be asked to authorize the increase.

The share capital of the Company at present consists of £500,000 in 250,000 ordinary shares of £1 each and 250,000 4% redeemable cumulative preference shares of £1 each. It is proposed to name the existing ordinary shares "B" ordinary shares, and to create £500,000 of new ordinary shares which will be known as "A" ordinary shares. It is proposed also to create £250,000 4½% irredeemable cumulative preference shares of £1 each. The "A" ordinary shares will be entitled to a dividend of 5% before any dividend is paid on the "B" ordinary shares, and to further dividends at ½% for every 1% paid on the "B" ordinary in excess of 6%.

Gas Consolidation, Ltd., controls a number of gas companies in the Midland area, and is interested in Severn Valley Gas Corporation, Ltd., and the Palatine Gas Corporation, Ltd.

## Women's Gas Council

### Altrincham Branch Visit Stove Works.

The Altrincham Branch of the Women's Gas Council recently visited the Works of Richmonds Gas Stove Company, Ltd. (Radiation Ltd.).

About 110 members joined in the visit and all the numerous processes in the production of cookers, fires, and water heaters were watched with keen interest.

Afternoon tea was served in the Recreation Room, after which Miss Howes-Smith, the President of the Branch, proposed a hearty vote of thanks to the Directors of the Richmonds Company. This was seconded by Mrs. F. Taylor, the Chairman of the Council, and supported by Mrs. F. A. West, who brought an apology from Mr. West (Engineer and Manager to the Altrincham Gas Company) for his absence owing to a Directors' Meeting. He sent his good wishes to the Council for a successful visit.

## British Industries Fair

### Good Augury for 1937

At a meeting of the Birmingham Chamber of Commerce held in Birmingham on June 8, Mr. J. Percy Plant, the retiring Chairman of the Management Committee of the Engineering and Hardware Section of the British Industries Fair, was re-appointed Chairman for the third year in succession.

Mr. Plant announced that within three months of its close more than 60% of the space occupied at the 1936 Fair at Castle Bromwich had already been definitely booked up and that they expected a further 25% to be re-booked in the immediate future.

The total space available at the moment was 292,531 sq.ft, of which 175,655 sq.ft. had been taken by 408 firms. The situation, said Mr. Plant, was very satisfactory and the interest taken by prospective exhibitors both old and new was greater than ever. Everything augured well for 1937.

## Morecambe Think of Selling

### Negotiations Authorized with United Kingdom

The Morecambe Town Council has decided, subject to proper statutory and other safeguards being provided for its protection and without committing itself to a definite policy, to authorize negotiations to be commenced and enquiries made with a view to ascertaining the exact terms upon which a sale of the Gas Undertaking to a Holding Company could be effected, and what would be the effect thereof from the point of view of the Corporation, the general body of ratepayers, and gas consumers in the area of supply.

An amendment reaffirming the principle that it is for the public good that such undertaking should remain in the hands of the municipality was defeated. The Company concerned in the negotiations is the United Kingdom Gas Corporation.

## Institution of Gas Engineers

In our report of the discussion on the Paper by Mr. J. T. Haynes at the Annual Meeting of The Institution of Gas Engineers the remarks attributed to Mr. T. R. Cook were in fact made by Mr. W. H. T. Johns, of Rotherham. Also, the figures of consumption per consumer should be corrected from 5,000 cu.ft. to 56,000 cu.ft. and the pre-tariff consumption for the same consumers from 3,000 to 30,000 cu.ft.

Mr. W. B. McLusky points out that in his remarks (p. 698, col. 2, line 5) the second "that" should read "the."

## British Chemical Plant Exhibition, 1936

### Preliminary Arrangements

The British Chemical Plant Exhibition, 1936, which is being held at the Central Hall, Westminster, S.W. 1, at the same time and in the same building as the International Chemical Engineering Congress of the World Power Conference, from June 22 to 27 next, will be opened at 11 a.m. by the Right Hon. Ramsay MacDonald, M.P., Lord President of the Council, at an Official Opening Ceremony to be held in the Great Hall of the Central Hall, on Monday, June 22. Invitations have been sent to a number of prominent industrialists and representatives of Government Departments, and Mr. MacDonald will be supported on the platform by a very influential and representative gathering. Invitations to the Opening Ceremony have also been sent by the Managing Committee and by exhibitors to other representative purchasers of chemical plant. The Managing Committee desires it to be known that if anybody interested in the manufacture or purchase of chemical plant has not received an invitation to the Opening Ceremony, they can obtain one on application to the Managing Committee, British Chemical Plant Exhibition, 166, Piccadilly, W. 1.

The Opening Ceremony will be followed by an Inaugural Lunch at the Hotel Victoria, Northumberland Avenue, London, W.C. 2, at 12.45 for 1 p.m. promptly, at which the principal guest and speaker will be Mr. Ramsay MacDonald. The price of the tickets will be 6s. 6d., inclusive of gratuities but exclusive of wines, and participation is open to all members of the British chemical industry and chemical plant industry, irrespective of whether they are members of the British Chemical Plant Manufacturers' Association or whether they are actually exhibiting at the Exhibition.

## Forthcoming Engagements

*(There will be no meeting of the Central Executive Board of the National Gas Council during the month of June.)*

**June.**

18.—S.B.G.I.—Council Meeting, 11.30 a.m.

18.—I.G.E.—Refractory Materials Joint Committee (Stoke-on-Trent), 2.30 p.m.

19.—North of England G.M.A. [Auxiliary Section].—Meeting at South Shields and Paper by Mr. J. R. Porter.

19.—Waverley Association of Gas Managers.—Annual Meeting at Edinburgh.

23.—I.G.E.—Gas Education Consultative Committee, 2.30 p.m.

24.—I.G.E.—Board of Examiners (Oral Examinations), 9.30 a.m.

30.—Southern Association.—Annual Summer Meeting.

**July.**

2.—I.G.E.—Joint Research Committee at 2.30 p.m.

3.—Manchester District Association.—Manchester Meeting.

8-10.—Canadian Gas Association and North-West Conference Pacific Coast Gas Association.—29th Annual Convention, Vancouver.

24.—Southern Association of Gas Engineers and Managers (Eastern District).—County Meeting at Swindon.

**Sept.**

10.—North British Association.—Annual Meeting at Kirkintilloch.

## Policemen Rely on Gas

### Appliances for Hendon College

We learn from the Gas Light and Coke Company's *News* that gas appliances of all kinds have been ordered for the Metropolitan Police College at Hendon.

Cookers, hot-closets, café sets, grillers, roasters, &c., are in the Police College, the Driving School, and the Sports Pavilion kitchens; cookers, fires, and coke boilers in the Superintendent's and Commandant's houses; and an L.J.K. refrigerator as well in the Commandant's house.

Equipment in the Science Laboratory includes 120 bunsen burners, 6 fume cupboards, 4 sterilizing burners, and a distilled water plant.

## Prize Winning Carnival Display

This decorated lorry which was entered by the Watford and St. Albans Gas Company in the Watford Carnival Procession on Whit Monday won the first prize in its class for the third year in succession—the award being a large silver cup and replica.

## Gas Progress in the Isle of Man

### Douglas Gives Bulk Supply to Crosby

On Friday, May 22, the bulk supply from the Douglas Gas Light Company to Crosby was inaugurated with due ceremony when His Excellency the Lieutenant-Governor switched over a lever which permitted gas to flow to Crosby and the intervening hamlets. The ceremony was witnessed by some 200 shareholders and assembled guests.

Mr. C. H. Kay, Chairman of the Company, opened the proceedings by saying that he remembered seven predecessors of His Excellency in office. He spoke of the Lieutenant-Governor's interest in providing the amenities of life in out-of-the-way places, in the way of up-to-date water supplies, and he suggested that gas came in a good second. He said that since the time the Douglas Gas Company was founded, over 100 years ago, it had more than kept pace with all the demands made on it in a growing town, for residents and visitors alike, and now it had extended its operations to Crosby. He then asked His Excellency to turn a valve which would enable Crosby to be supplied with gas, and also set in motion the newly-installed coke-screening plant.

His Excellency, after performing these operations, said that Douglas could congratulate itself on having a very up-to-date Gas-Works.

A charming little incident followed. Miss Millie Bisset, daughter of Mr. A. R. Bisset, the Engineer and Manager, and Mrs. Bisset, presented a bouquet to Lady Butler, who accompanied His Excellency.

Mr. Bisset then gave a few interesting statistics. He said the Douglas Company carbonized 18,000 to 20,000 tons of coal in a year, thus giving employment to 65 to 70 miners, in addition to transport workers. The Gas-Works could produce 1,500,000 cu.ft. of gas a day, and in the season sent out a million cu.ft. a day. In addition, they supplied 152,000 gallons of tar; 22,000 gallons of creosote oil to Imperial Chemical Industries, Ltd.; they sold 33,000 gallons of benzole to Manx Petroleums, and lately they had produced a sheep dip which had been approved by the Minister of Agriculture and Fisheries.

A vote of thanks was accorded His Excellency, on the motion of Mr. R. C. Cain, R.G., M.I.C., and Mr. R. Q. Hampton, H.K., Directors

An exhibition of sheep-dipping was given at the close of the proceedings, and most of those present availed themselves of the invitation to inspect the plant.

## British Standards Institution

### Annual Meeting and Luncheon

The Annual General Meeting of the B.S.I. was held at the Institution of Mechanical Engineers on June 4, 1936, under the Chairmanship of Mr. W. Reavell, M.I.Mech.E. A large number of members were present.

Before commencing the business of the meeting a very warm tribute was paid to the late Sir Archibald Denny, Bart., who was one of the pioneers of this National Movement of Standardization, and it was resolved to place on record their highest appreciation of all that Sir Archibald Denny had done for the progress of this national work during the many years he had been connected with it, and particularly as its Chairman from 1916 to 1927.

Mr. Reavell, in reporting on the progress of the work during his year of office, made reference to the forthcoming visit of the Director to New York and the Argentine in connection with the work of the newly-formed Argentine Institute for the Rationalization of Materials.

At the Luncheon at the Royal Automobile Club which followed the meeting, the Rt. Hon. the Lord Riverdale, K.B.E., who was the chief guest, in proposing the toast of the Institution, referred to the very economic manner in which the work was carried out dealing as it now does with some 800 Committees and over 1,000 meetings a year. He felt that "Empire Standards" was one of the ways in which it was possible to bind the Empire together and consolidate Empire trade. Some people feared that standardization meant stagnation, but this was provided against in the precautions the B.S.I. took when standards were brought into being and in the frequent review and revision of those standards.

Mr. Reavell, the retiring Chairman, thanked Lord Riverdale for his invaluable aid.

Mr. E. J. Elford, the Chairman for the forthcoming year, in proposing the toast of "Those associated with the B.S.I.," said that the organization was greatly indebted not only to the Government for their continued financial support, to the many technical officers of the various Government Departments for their assistance on the technical work, but also to the hundreds of representativs of Industry, using that word in the widest sense, who gave their time and experience so willingly to this work of growing national importance.

The toast was replied to by Mr. S. Tatchell, F.R.I.B.A., Chairman of the Building Industries National Council, and also by Colonel Briggs, of Messrs. Unilevers.

## Three Counties Show

A view of the Stand, designed and erected by the Worcester New Gas Light Company in conjunction with the British Commercial Gas Association, at the Three Counties Agricultural Show. A report appeared on page 772 of last week's "JOURNAL."

# Centenary Celebrations "Down Under"

GAS IN THE HOME
ALL COMMERCIAL & INDUSTRIAL PURPOSES
GAS FOR FACTORIES WORKSHOPS
GAS FOR HEATING & VENTILATING
GAS FOR HOTELS CAFES HOSPITALS

## South Australian Gas Company's Display

The Centenary Celebrations of the State of South Australia have recently been held at Adelaide, and the South Australian Gas Company organized a striking display, which was successful in creating a considerable amount of interest among visitors to the Exhibition, resulting in good business for the Company. The accompanying photograph, which was forwarded to us by the Company's London Agents (Wm. Coward & Co., Ltd.), shows a section of the exhibit.

## Coal-Gas Driven Omnibus

### A Wallasey Experiment

Wallasey Corporation is running a double decker omnibus on bottled gas. The experiment is being made in consequence of the successful operation of six Gas Department lorries over 36,000 miles during the past 18 months.

The bus has been placed on the New Brighton-New Ferry route and will be run alternately on petrol and gas for comparative tests. It is claimed that 280 cu.ft. of gas is the equivalent of one gallon of petrol, and as this gas is charged at the rate for public lighting—1s. 10d. per thousand cu.ft.—a competitive price for petrol would be 7d. per gallon. The driver can change over from petrol to gas or *vice versa* without leaving the cab. The gas is carried in two 6 ft. sealed cylinders, carrying 350 cu.ft. of gas, which will run the bus for twelve miles.

## Revised Scale of Charges at Darlington

### Block Rate Introduced

The charges for gas have been revised at Darlington, and a series of block rates, applicable to domestic consumers, has been introduced. The following is the new scale for ordinary consumers within the Borough, and all prices are subject to 5% discount for prompt payment.

| Gas Used per Quarter. | Price per Therm. | |
|---|---|---|
| | Gross. | Net (Gross less 5%). |
| | d. | d. |
| First 10 therms (= 2,100 cu.ft.) | 7·25 | 6·89 |
| Next 15 therms (= 3,200 cu.ft.) | 6·31 | 6 |
| All over 25 therms (= 5,300 cu.ft.) | 4·21 | 4 |

In the outer districts the following scale applies:

| Gas Used per Quarter. | Price per Therm. | |
|---|---|---|
| | Gross. | Net (Gross less 5%). |
| | d. | d. |
| Blackwell and Whessoe— | | |
| First 10 therms (= 2,100 cu.ft.) | 8·25 | 7·84 |
| Next 15 therms (= 3,200 cu.ft.) | 7·34 | 6·95 |
| All over 25 therms (= 5,300 cu ft.) | 5·24 | 4·95 |
| Croft, Hurworth, Middleton, and Sadberge, and all other districts— | | |
| First 10 therms (= 2,100 cu.ft.) | 10·25 | 9·74 |
| Next 15 therms (= 3,200 cu.ft.) | 9·32 | 8·85 |
| All over 25 therms (= 5,300 cu.ft.) | 7·21 | 6·85 |

## Alva Gas-Works

### Negotiations for Sale to Alloa Completed

Negotiations have been completed by the Alloa Town Council for the taking over of the gas undertaking belonging to Alva Town Council. The purchase price is £11,000.

The annual make of gas in Alva is about 44 million cu.ft., the existing gas rate being 3s. 9d. per 1,000 cu.ft. for ordinary consumers and slot meters. The Alloa rate to be charged from next February will be 3s. 4d. to 2s. 10d. per scale for ordinary consumers, and 3s. 6d. to 3s. per scale for slot meters, and the rents for meters and cookers on simple hire will be abolished. It was proposed to cease the manufacture of gas at Alva Gas-Works in the early spring of 1937, when a supply gas main will be connected from Alloa Gas-Works and taken off the existing high-pressure pipe at present supplying the burgh of Tillicoultry.

The manufacturing plant at the Alloa Gas-Works will require to be added to by the introduction of more retorts and certain other auxiliary plant. The village of Menstrie is also included in the Alva gas supply.

## Smokeless Solid Fuel

### Plans to Supply Town Gas

A statement has been issued to the effect that the first unit of a series of "gas grids," drawing supplies from large plants manufacturing solid smokeless fuel, is shortly to be brought into full operation in West Lancashire, West Cheshire, and North Wales. Coal consumption at the Stellite Works, Queen's Ferry (which Company issues the announcement) is to be increased to 4,000 tons per week, and plans are being prepared for the construction of similar plants in the London district, Durham, North and South Wales, parts of Scotland, and the South Coast of England.

The statement goes on to say that this development has been put in hand as the result of a rapidly increasing demand for solid smokeless fuel at prices comparable with those of the best grades of house coal. By carbonizing the coal at a medium temperature and finding a market for the large quantity of gas generated during the process, the fuel can be sold at a reasonable price. Already the Stellite Company own the Connah's Quay and Harwarden Gas Undertakings, which are supplied with gas from the carbonizing plant, and negotiations are now taking place for the acquisition of other gas interests or of supplying them with gas in bulk. Also associated with this development are important plans for the extension of the "gas grid" system from Queen's Ferry through parts of West Lancashire, West Cheshire, and North Wales. Mr. Samuel Moore, Managing Director of the Stellite Company, is responsible for the development of this particular process of carbonizing coal at a medium temperature.

# Cochranes' "Super-Spun" Iron Pipes

## Lord Londonderry Opens New Plant at Ormesby Iron Works

On Friday last the Rt. Hon. the Marquess of Londonderry, K.G., M.V.O., started five out of six machines which are producing what are claimed to be the longest cast-iron pipes ever made in this country.

General View of the Plant (Cupola Side).

The plant is at the Ormesby Iron Works of Messrs. Cochranes (Middlesbro') Foundry, Ltd., and comprises four cupolas, the six centrifugal casting machines, and one normalizing furnace.

Cochranes were not the pioneers of centrifugal pipe casting; but they have developed in this country a process which has been accepted as an important advance on the original methods. In the original system, molten iron was introduced into a revolving metal mould; and during the past twelve years or so, this method has been in common use not only in this country, but also in America, Australia, Germany, France, and Japan. A few years ago Monsieur Mairy, a Belgian Engineer, invented a method of introducing powdered ferro-silicon into the mould, prior to the casting of the hot metal, thereby avoiding the hard "chill" formed on the outer surface of the pipe, which in the original centrifugal system necessitated annealing in order to prevent brittleness.

The original plant at Cochranes' Works, which has been demolished within the past few weeks, enabled centrifugal pipes to be made by the Mairy process without the necessity of any annealing furnace. Experiments proved, however, that if these Mairy-made pipes were subsequently heat-treated in a normalizing furnace, their quality was considerably improved, and consequently the new plant has been provided with the heat-treatment or normalizing furnace.

The Cochrane Company are gratified to realize that the original world-pioneers of the centrifugal iron pipe, the Stanton Company in the Midlands, have found it advantageous to adopt the Mairy process with the De Lavaud metal mould system. In consequence, the now well-established plants of the Stanton Company are to-day operating the Mairy process under licence from the Cochrane Company; and in return for this licence, the Stanton Company have granted Cochranes a licence for the De Lavaud rights. This means that centrifugally cast pipes, combining the advantages of the De Lavaud system and the Mairy process, are to-day being produced both by this Company and by the pioneers of the centrifugal system at Stanton.

A fracture of "Super-Spun" iron pipe discloses a two-zone structure, the outer zone consisting of closely-interlocked dendrites in multi-directional formation, giving high ductile strength or impact resistance, and an inner zone having a characteristic centrifugal structure with finely-dispersed graphite, producing high tensile strength. The result is a combined ductile and tensile strength greater than that of any cast-iron pipes previously made.

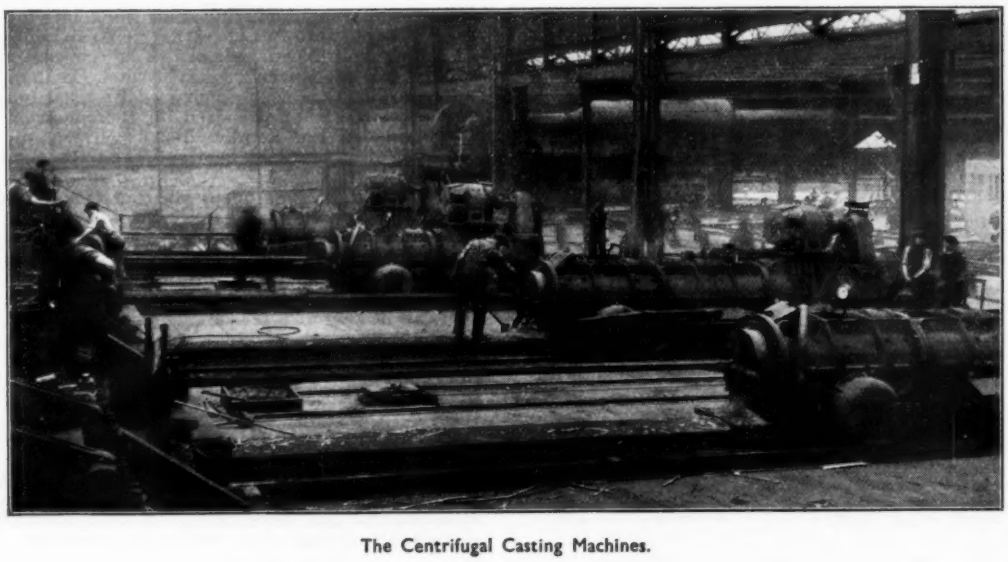
The new pipes will be made in 7-yd., 6-yd., and 4-yd. lengths, ranging in diameter from 3 to 24 in.

### Opening Ceremony.

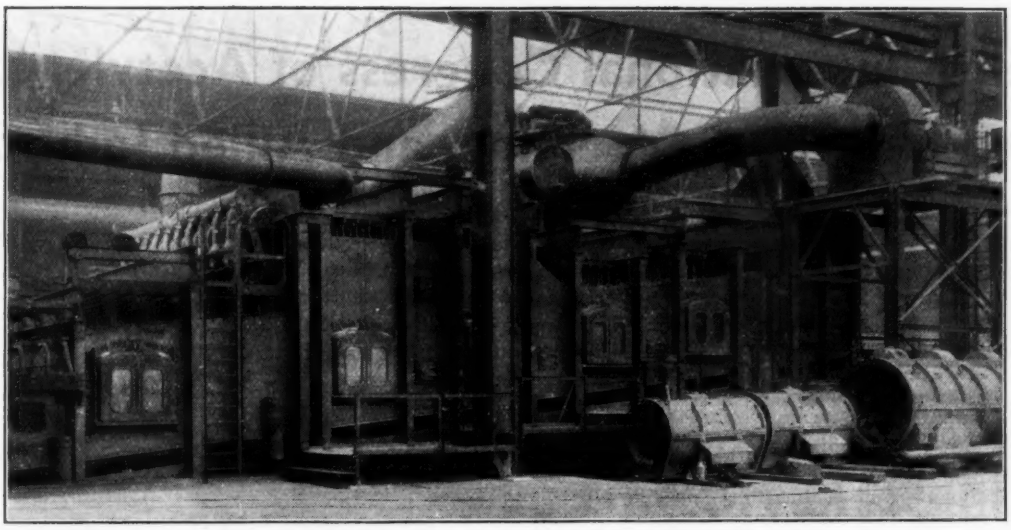
It was in the presence of nearly 200 guests assembled on a platform erected in the new shop that Lord Londonderry pressed a button and officially set the plant in action. Soon the five machines were at work, and the row of pipes on the conveyor to the normalizing furnace rapidly grew in length. A thorough inspection of the plant, from cupola to pipe test, was made; and then a buffet lunch was served in the offices.

Afterwards Mr. E. J. Fox (Chairman), Sir Cecil Cochrane, J.P., and Mr. J. N. Derbyshire, J.P. (Directors), escorted Lord Londonderry to a platform, and the large party of visitors gathered round.

Mr. E. J. Fox said his task was the short and easy one



The Centrifugal Casting Machines.



The Normalizing Furnace.

of asking Lord Londonderry to declare the new section of the works open, after which Sir Cecil Cochrane would thank his Lordship for coming that day, and in effect giving the new undertaking a "leg up." Lord Londonderry required no introduction in the North of England, or indeed anywhere in industry. Mr. Fox, calling attention to the contrast between old and new methods, said the visitors would probably have noticed stores of rough looking pipes during their tour of the works. These were pipes cast in green sand by the old process. There was still a demand for these, for some people still seemed to want something that was not only cheap but looked cheap. Pit-cast pipes also were still produced on the works, and here again the demand was very slow in dying; but they could be thankful for this from the point of view of the labour employed. Finally, he referred to the "Super-Spun" pipes, for the manufacture of which five out of the six machines had been started by Lord Londonderry that morning. These would now turn out 20 miles of pipe a week, and they looked forward shortly to 40 miles a week. Pipes made by this method were five times stronger than any previous centrifugal pipe of the same thickness; and they were twice as strong as a comparatively thick pit-cast pipe.

Lord LONDONDERRY, addressing his "friends of the North Country," said that he had accepted the invitation with alacrity, not as an industrial expert, but because he felt that by so doing he was helping forward a stimulus to trade. He had been very pleased to be responsible for starting a new process in the works of a firm which was established nearly a century ago. Referring to the industrial depression, Lord Londonderry said that the English were a cautious race, but he thought they could detect an upward trend in trade; and in coping with the manifold difficulties that confronted them, they were taking the fullest advantage of scientific invention. Lord Londonderry then read a brief statement describing the steps which led up to the inauguration of the new plant, and expressed his great satisfaction at this example of the progress which was taking place in their midst. In conclusion, he referred to the industrial situation in general. There did seem to be something of an upward trend, and that volatile creature, prosperity in trade, seemed somehow to be alighting upon the country; but the problem of the distressed areas still confronted them. Something had to be done; but when they came to the young men and found the flower of youth deteriorating, they were faced with a tremendous psychological problem. They had to look for root causes; and one cause of the trouble was the international situation. It was up to the Government, a wise Government, to find some solution for the distrust which existed among the nations; and he believed that they need not lose hope in the League of Nations being able to restore confidence. Abundance all over the world was wanted, and an international understanding about trade. Until the world realized that all nations would stand or fall together, then the world would continue to march on to some great catastrophe.

Sir CECIL COCHRANE said it was his very pleasant duty to convey to Lord Londonderry, on behalf of the Directors of Cochranes (Middlesbro') Foundry, Ltd., and all present, their thanks for his visit. He (the speaker) had spent twenty of the happiest years of his life at the Ormesby Works. They were all agreed that the Directors had made a very happy choice in selecting Lord Londonderry for the function. He was widely esteemed not only in the North of England, but all over the country, and it was hoped he would always remember the day when he had helped to reinstate a great industry in Middlesbrough. As a memento, the Directors asked his acceptance of a silver cigar box.

Lord LONDONDERRY, in acknowledgment, assured the Directors that he required no memento of a day which signified to a great city the continuance of an industry it had known for many years. He wished the new undertaking every possible success, and he hoped to visit them again and renew the delightful acquaintances he had made.

In conclusion, Mr. BENJAMIN TALBOT, Deputy-Chairman and Managing Director of the Cargo Fleet Iron Company, moved a vote of thanks to the Chairman. The remarkable works they had visited showed, he said, what could be done by science and the application of research.

## Steam Road Wagons

### Deputation to the Ministry of Transport

Capt. A. U. M. Hudson, M.P., Parliamentary Secretary to the Ministry of Transport, received last week a deputation of representatives of the coal industry and of those concerned in the manufacture and use of steam road vehicles.

The deputation consisted of representatives of the Coal Utilisation Council, the Mining Association of Great Britain, the Monmouthshire and South Wales Coalowners' Association, the Commercial Motor Users' Association, the National Road Transport Employers' Federation, the Sentinel Wagon Works, Ltd., the Coal Merchants' Federation, and the London and Counties Coke Association. It was introduced by Colonel D. Clifton Brown, M.P., who was accompanied by Mr. Tom Smith, Labour member for Normanton, and Capt. A. H. M. Ramsay, M.P., and was led by Mr. H. H. Merrett, the well-known South Wales colliery owner.

Mr. Merrett pointed out that since 1931, 5,000 steam wagons had disappeared from the roads, and this meant that at least 2,500 miners (many of them in the depressed area of South Wales) had been put out of employment. The main reasons for this were the smaller payload which, under the existing regulations, the steam wagon was able to carry as compared with petrol or oil-driven vehicles of the same power, and the lower speed at which some of the models were compelled to travel.

The deputation therefore asked for some revision of the regulations so as to remove the disabilities under which steam wagons were at present operated, and Captain Hudson promised to give careful consideration to the case put forward.

# Twelfth International Congress of Acetylene, Oxy-Acetylene Welding, and Allied Industries

**The first international gathering of acetylene and welding interests to be held in this country for twenty-eight years took place last week, when the 12th International Congress of Acetylene, Oxy-Acetylene Welding, and Allied Industries was held in London under the Presidency of Dr. J. Donald Pollock, O.B.E., and representatives from many countries were present.**

As befitted so important an International Congress, the Inaugural Ceremony was accorded the honour of being held in the dignified setting of the Guildhall, whose historical associations lent distinction to the opening proceedings on the morning of Monday, June 8, the first item of which was the reading by the President (Dr. J. Donald Pollock) of a message of good wishes from His Majesty the King, who, as Prince of Wales, had graciously accorded his Patronage to the Congress.

The President, in the course of his introductory remarks, thanked the Lord Mayor of London for the privilege of holding their first meeting in the Guildhall. He felt sure, he said, that the deliberations of the Congress which were to follow would prove of the greatest benefit to all concerned, and he wished them all success on behalf of those whom he had the honour to represent.

An Address of welcome was given to the delegates by the Rt. Hon. Lord Alness, K.C., in the course of which he observed that they desired to recognize and stress the importance of scientific study, the correlation of which, together with research, was of immeasurable value. He went on to refer to the early days of their Congress, the first of which was held in Berlin in 1898, when the use of gas was confined almost entirely to illumination. Subsequent Congresses were held at Budapest, Paris, Liege, and other places, by which time the various processes in which they were interested to-day were beginning to emerge. In the year 1908 the Congress was held for the first time in London, when fewer than fifty delegates attended. Later, Congresses were held at Vienna, Rome, Paris again, Brussels, and Zurich, which was some indication of the cosmopolitan nature of their gatherings. No fewer than 800 delegates attended the Congress in Rome, at which high officials of the Italian Government were present. Altogether, they could look back on the past with a considerable measure of satisfaction.

Turning to the present, Lord Alness remarked that this Congress possessed at least four features which rendered it unique among its predecessors. In the first place it was the first international congress to be honoured by Royal Patronage, for it was under the Patronage of His Royal Highness the Prince of Wales, graciously accorded prior to his accession to the Throne. Then, this was the first acetylene congress in this country for twenty-eight years. It also marked the centenary of the discovery of acetylene as a gas, being in addition the fiftieth anniversary of the commercial production of oxygen, the first plant for that purpose being installed in Westminster in the year 1886. From that had sprung the British Oxygen Company, of which their President was Chairman. To-day some two hundred trades were using oxygen, including many of the major industries such as railways, collieries, steel manufacture, and aircraft construction. Their Congresses were intended to promote and encourage research work to further the uses of their various processes in these and other industries. The future was bright, said Lord Alness in conclusion, and in their responsible deliberations he wished them well and bid them God speed.

The delegates were then addressed by M. A. Gandillon, the President of the Swiss Acetylene Association and of the Commission Permanente Internationale, followed by Mr. R. L. D. Martin, who spoke on behalf of the Organizing Committee of the Congress.

## Distribution of Medals.

There followed the distribution of prizes by the Rt. Hon. Lord Alness for Papers submitted to the Congress. These were as under:

*XIIth Congress Gold Medal with Vellum Certificate.*
Monsieur R. MESLIER (France).

*XIIth Congress Silver Medals with Vellum Certificates.*
Messieurs J. BRILLIE, A. LEROY, A. ROUX (France),
and
Messieurs F. GOLLING and P. TULACZ (Poland).

*British Acetylene Association Gold Medal with 25 Guineas.*
[Awarded for the best Paper submitted in English by persons of British nationality].
C. G. BAINBRIDGE and R. E. DORE (Jointly).

*British Acetylene Association Silver Medal with 10 Guineas*
W. H. G. HIGNETT.

The subsequent proceedings of the Congress took place at the Caxton Hall, Westminster, and were divided into eight sessions devoted to the presentation of technical Papers and discussions thereon.

There was, in addition, an exhibition at the Caxton Hall of acetylene welding apparatus, divided into seven sections, with a further section for photographs. In each section there were sub-divisions for the Associations of the various countries represented. Exhibits were received from the following countries: Austria, France, Germany, Holland, Hungary, Poland, Russia, and the United Kingdom. Films were also shown each day of the Congress dealing with different phases of the industries involved. The subject of these films included oxygen cutting—some industrial applications; rail welding—re-surfacing of worn railway points and crossings; cutting parts for conveyor chains; the demolition of the "Mauretania;" oxwelding and cutting; under-water cutting; welding of hot water piping installations and industrial piping; oxwelding of pipelines for oil and gas; and many other welding applications.

## Social Functions and Visits.

Various social functions and visits were organized in connection with the Congress. On the Monday evening there was a Government Reception at the London Museum, Lancaster House, St. James's, S.W. 1, at which the Rt. Hon. Sir Kingsley Wood, Minister of Health, and Lady Wood received the delegates.

On the Tuesday evening the Congress Banquet was held at Grosvenor House, Park Lane, W. 1, at which some 500 delegates and guests were present, the President in the Chair. Musicians from the band and the pipers of His Majesty's Scots Guards, by permission of Col. E. W. S. Balfour, D.S.O., O.B.E., M.C., Lieut.-Colonel Commanding the Scots Guards, played during the function, and an excellent cabaret entertainment followed the toasts.

The toast of "The Continental, American, and other Acetylene Associations" was proposed by Mr. A. B. Harrower, and responded to by M. Gandillon, M. Granjon, Herr Dr. Rimarski, M. Caris, and Dr. A. B. Kinzel. That of "British Dominions and Overseas Acetylene Associations" was in the hands of Major C. P. N. Raikes, M.C., and the response by Mr. J. March Hardie and Mr. H. E. Mussett. "The President of the 12th Congress and the British Acetylene Association" was proposed by M. Thomandi and responded to by Dr. Pollock.

Other functions in connection with the Congress included, on the Wednesday, a visit to the works of the British Oxygen Company, Ltd., at Edmonton, or, alternatively, an inspection of the works of Messrs. Electrolux, Ltd., at Luton; and, on the Thursday, a river trip on the Thames. Motor coaches conveyed the delegates to Paddington, where they entrained at 6.30 p.m. for Marlow; from here they travelled by boat to Windsor, returning from there by special train to London at about 11 p.m. Dinner was provided on board ship. On the Friday evening, at the invitation of the British Oxygen Company, the delegates visited the Aldershot Tattoo.

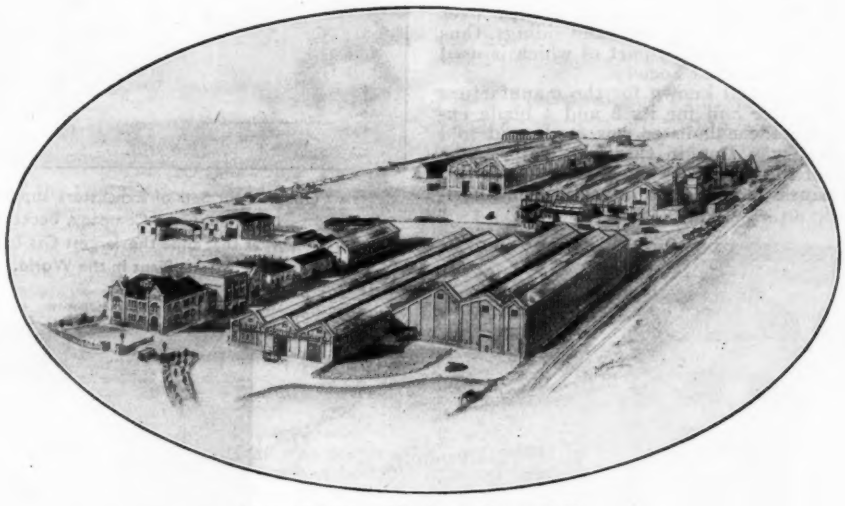
# LONG SERVICE TO THE GAS INDUSTRY

A number of firms of long standing on the contracting and manufacturing side of the industry have collaborated with the "JOURNAL" in the production of a series of articles, under the above title.

## The Bryan Donkin Company, Ltd.

The Bryan Donkin Company, Ltd., of Chesterfield, belongs to the early days of mechanical engineering, and therefore has an interesting history.

The founder of the business was Bryan Donkin, who was of Northumbrian birth, having been born at Sandhoe in 1768. His father held the land agency of several large estates in that county. Bryan Donkin assisted his father until he was 20 years of age, when he came south to be agent to the Duke of Dorset at Knowle Park, Sevenoaks. Having a strong bent to engineering, he was advised by Smeaton, who built the Eddystone Lighthouse, to adopt mechanical engineering as his profession, and was introduced to John Hall, of Dartford, to whom he was articled for three years. He afterwards married Mrs. Hall's sister. In 1803 Bryan Donkin started in business at Bermondsey, London, S.E., founding works which continued for 100 years, when the business was removed to Chesterfield. There it still continues as a live and active business.



View of Present Works at Chesterfield.

Bryan Donkin's first work was the perfecting of the Fourdrinier Paper Machine, which he was the first to manufacture and the first to sell. He thus laid the foundation of a great industry, as previously all paper had been made by hand. He built up a flourishing business, which was carried on by his sons and grandsons until about 1890, when the Company confined its energies almost entirely to the Gas Industry, which is its chief business to-day.

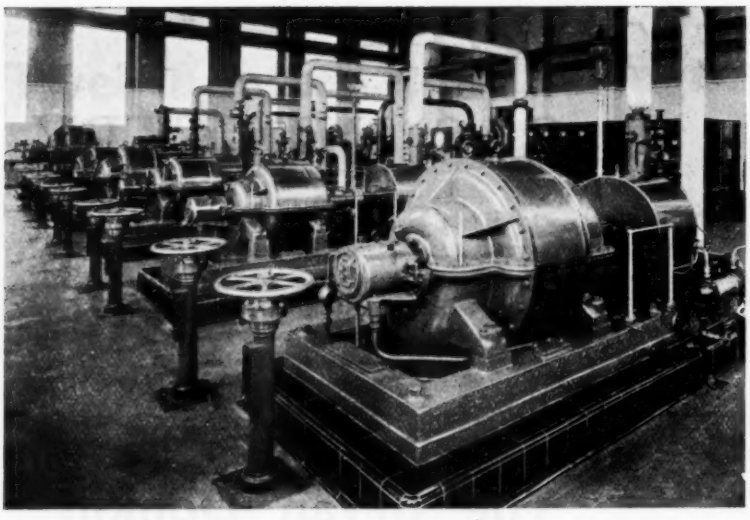
In 1808 Bryan Donkin took out the first patent for a steel pen, and it is claimed that he was the originator of the steel pen industry.

In about the year 1808, experiments had been made by a French chemist named Appert for preserving meat. Bryan Donkin with two others—Hall and Gamble—acquired the rights of the process, but it was found to be incomplete. Donkin, with his inventive mind, pursued the question of preserving foodstuffs, and eventually succeeded in founding the now great industry of canning foods. Samples of the first successful experiment were approved by the Prince Regent, and thus started this important business. Some of the meat canned by Donkin was taken by Franklin on his ill-fated search in the Polar regions. Several tins were recovered by McClintock in 1857 when he brought back the Franklin relics to this country, and one of the tins is in the possession of the Company at Chesterfield to this day.

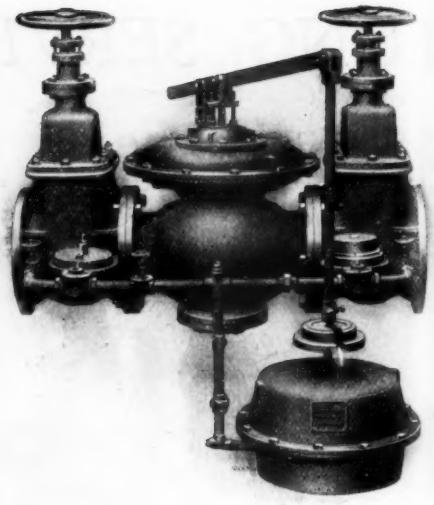
Bryan Donkin's portrait is now in the National Portrait Gallery, included in that wonderful group of the Great Men of Science who lived in the early years of the 19th Century.

About 1847 Donkin made the gas valve which bears his name, and which may be considered as the beginning of the Company's work in the Gas Industry. In 1858 the Company started the manufacture of the, at one time, well-known Farey Compound Steam Engine, which was patented by B. W. Farey, a partner of Donkin's sons, Bryan and Thomas Donkin.

Much more might be written about the inventive genius of the original Bryan Donkin, but this article is rather concerned with the Gas Industry and the activities of the Company since its removal to Chesterfield at the beginning of the present century, when Mr. Edwin Bryan Donkin, a grandson of the founder, continued as Managing Director until his death in 1906. He was succeeded by Mr. George Clark, M.I.Mech.E., M.Inst.Gas E., who is an Alderman of



Six Rateau Turbo Exhausters, driven by Steam Turbines, at the Gas Light and Coke Company's Brentford Works.



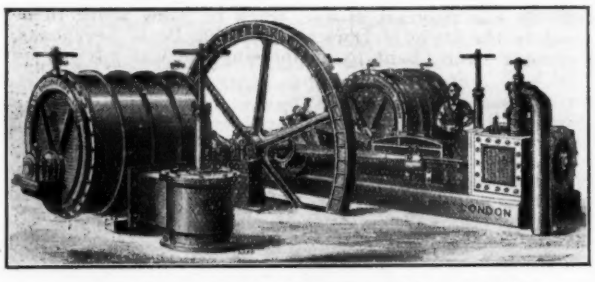
High Pressure District Gas Governor.

the Chesterfield Corporation and an Alderman of the Derbyshire County Council. He was Mayor of Chesterfield 1922-23, Chairman of Chesterfield Gas Committee for 23 years, and is a Justice of the Peace and a Commissioner of Income Tax. He is a member of the Council of the Society of British Gas Industries, was Chairman of the Council in 1921-22, and is a Vice-President of the British Commercial Gas Association and the National Gas Council. He is also a member of the Royal Commission to investigate the conditions of Local Government on Tyneside.

Under Mr. Clark's control the business has considerably developed, and the works at Chesterfield now cover 14 acres. The machine, fitting, and testing shops occupy over 1½ acres, and the two iron foundries 1 acre, and these, with the smiths' shop, pattern shop, &c., in all occupy over 4 acres. There are about 4 acres of roads and sidings, thus leaving about 6 acres for extensions, part of which is used by the men's successful Allotment Society.

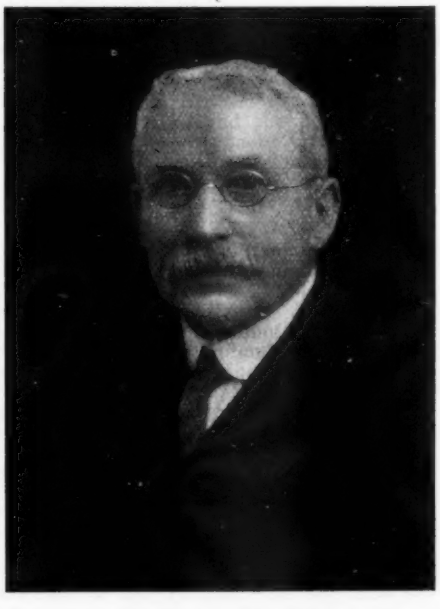
The Company is to-day well known for the manufacture of the "Beale" exhauster and for its 3 and 4 blade exhausters. The first 3-blade exhauster was made and sold in 1874, and Messrs. Bryan Donkin therefore claim to be the original makers of the 3-blade exhauster.

A considerable business is now done in vertical and horizontal reciprocating compressors, as well as rotary compressors of the multi-blade and two blade types. There is a special department for the making of gas governors of all types, including the well-known Reynolds' district governor. Many thousands of all kinds are turned out each year. The valve department is more flourishing than ever. All types of gas valves, in sizes from ½ in. to 60 in.

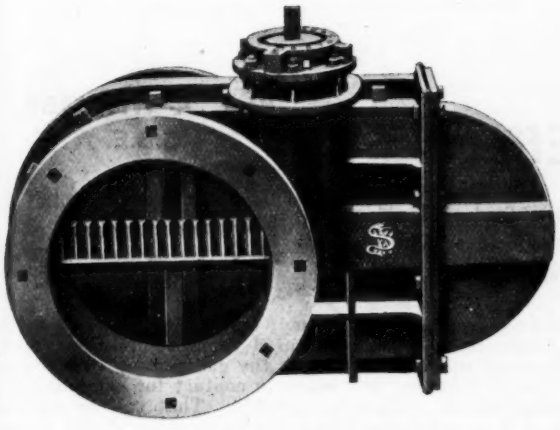


One of Four Sets of Exhausters supplied to the Gas Light and Coke Company, Beckton, in 1880, at that time the largest Gas Exhausting Plant in the World.

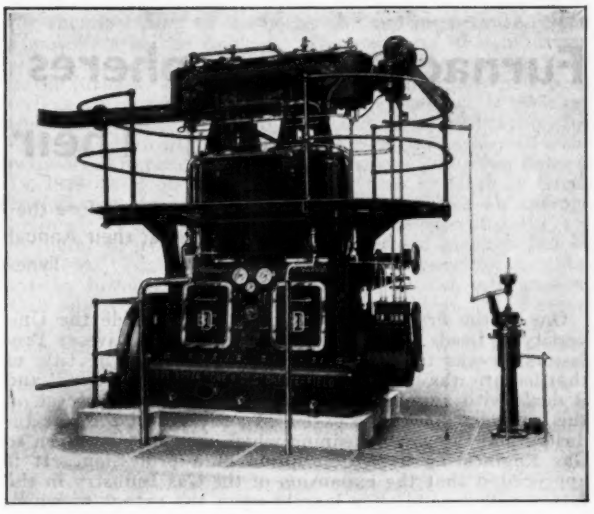
Bryan Donkin, F.R.S.
1768-1855.



Alderman George Clark, J.P.



"Donkin" Gas Valve, Rack and Pinion Type.



Vertical Reciprocating Gas Compressor, Steam Driven, Duplex Type.

diameter, and for high and low pressures, and also hot gas valves for blast furnaces, are produced in large numbers.

In 1910 the Company acquired the rights, in this country and the Dominions, of the Rateau Turbo Exhauster, which rights have since been extended from time to time for much of their other work. Very large sales have been obtained for the Rateau machines, both in this country and in Canada; in fact, many hundreds have been supplied, and the department dealing with this work is always fully employed.

In 1922 The Bryan Donkin Company secured, through the late Sir Arthur Duckham, the sole British rights of the Surface Combustion Corporation of U.S.A. To exploit these, they formed a separate Company, known as British Furnaces, Ltd., Chesterfield, which has made considerable strides and has played a great part in the sale of industrial gas, especially in the printing and motor car industries.

It may be said in conclusion that, although the name of Donkin is old, with very fine traditions, yet the Company as it exists to-day is young and virile, and plays no mean part in the great Gas Industry of this country and its Dominions and Colonies.

## Athletic and Social

### Gas Light and Coke Sports.

It says a lot for the popularity of this event that such a large and enthusiastic crowd faced an intermittent drizzle at the Acton Sports Ground for the Annual Gathering of the Gas Light and Coke Company on Saturday, June 13. Several hundred sat down to luncheon, which was presided over by Sir David Milne-Watson, LL.D., D.L., and after it a vote of thanks to the Governor and the Directors was proposed by Mr. O'Connor, a man 40 years in the service of the Company. Contrasting the conditions of workers in other times with the present, he emphasized the excellent effect on the men to-day of the privileges accorded them by the Co-Partnership scheme, mentioning the spacious dining and bath rooms, the increased leisure and holidays which went to make for the industrial harmony that had always been advocated by Sir David, and which were so largely the results of his efforts. He said that the co-partners would always do their bit while there were such a Governor and Directors on the Board. The seconder, Mr. Rayner, fully agreed with these sentiments.

Sir David Milne-Watson, rising amid applause, wished to thank the speakers and all those present, and was deeply appreciative and proud to be connected with such a body of men. He often wished that he could address all 22,000 of his employees and give them all luncheon. Referring to the weather, he remarked humorously that it had been "a splendid winter and spring—cold, inclement—all, in fact, that a gas man could desire." They had showed London just what the Gas Industry could do; but he was sorry he had not been able to arrange fine weather for the Sports.

He continued that, whatever the weather, they must do their very best to show the public that it really wanted gas. From the Directors downwards, what each man did counted, and if they did well they would prosper, "'weather' or no." They must know their work thoroughly; the inventors and engineers would supply them with the ideas and the plant. A few years ago gas refrigeration was scarcely heard of; to-day it stood ahead of all other refrigerators in the country. The Gas Industry had always tried to keep abreast of the times; now it must endeavour to be ahead of them.

The proposer and seconder of the vote of thanks had spoken of their grounds, pensions fund, holidays with pay, &c. He hoped that before the year was out the new Hospitals scheme, the rules of which were now in preparation, would be inaugurated and prove just as successful. In conclusion, Sir David said that he was pleased so many had accepted his invitation, and glad to be surrounded by such a large and splendid body of men.

The luncheon was followed by the chief attraction, the sports, with events for all ages, including the Tiny Tots, and side shows were well patronized. Tea and dancing round the bandstand followed.

### South Metropolitan Ambulance Tests.

The final tests for the "Good Samaritan" Trophy were held at the Vauxhall Institute of the South Metropolitan Gas Company on Tuesday, May 19, when eight teams from the various stations and depôts competed. The original entry was very much larger, the numbers being reduced by an eliminating competition.

The competition, which was inaugurated as far back as 1903, has, with the exception of the period of the Great War, been held each year since.

The judges were Dr. R. B. Duncan and Dr. A. C. White-Knox, and the maximum number of marks awarded for the various tests was 300.

The teams finished in the following order:

| | |
|---|---|
| Phœnix Wharf (Chemical Works) . | 191 |
| Vauxhall Gas-Works . . . . . | 180 |
| East Greenwich Gas-Works . . . . | 172 |

The finishing order of the other teams was Meter Shop, Headquarters, Women Employees, Old Kent Road Gas-Works, and Thames Street Depôt.

The staging of the tests with scenery, &c., in order to make matters more realistic was up to its usual high standard, while the general team work of the various entrants showed the usual standard of efficiency.

The work of the teams was witnessed by a large and appreciative audience.

### A Billiards Championship Goes to Richmonds: Success of Warrington Works Team.

They take their billiards very seriously in the North, and to come out winners in a District Works Knock-out Competition is no mean achievement. Yet this is a distinction which recently fell to Richmonds Gas Stove Company, Ltd. (Radiation Ltd.), when their Warrington Works' Billiards Team won the final and carried off five handsome clocks and two wrist watches as a reward for some very keen and skilful play.

In addition to the natural enjoyment of the game, these Inter-Works Competitions create a tremendous amount of enthusiasm and promote a social spirit among the contestants and their friends, who look forward to the repetition of these events with eager anticipation.

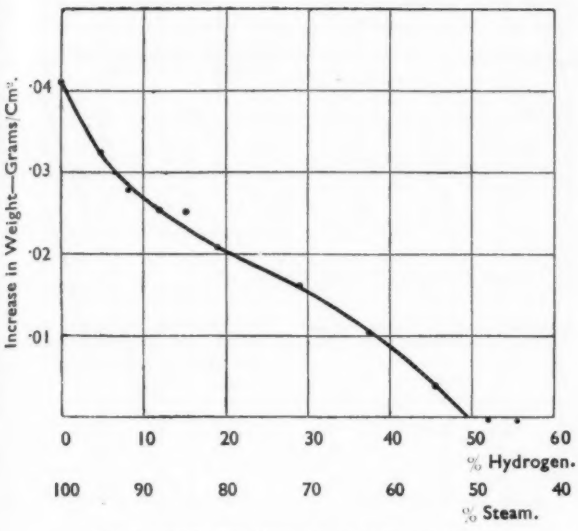



Fig. 2.—Scaling in Mixtures of $H_2O$ and $H_2$.

will actually leave the hearth of the furnace in the unburned state with its heat of combustion unrealized.

## Factors Tending to Lower Furnace Temperatures.

I may also point out that the temperature will be lower if the gas coming forward to the furnace for combustion is already loaded with inert matter such as the nitrogen which is always present to the extent of approximately 50% in the producer gas. Also, supposing a washed gas is used, and the cooling and washing have not been carried far enough, so that the gas is still saturated well above air temperature, the water vapour in that way introduced into the furnace is another inert material tending to lower the temperature in the furnace.

Considering the opposite effect the temperature generated in the furnace will be raised if the air or gas is heated by recuperation or regeneration before entering the furnace, or if loss of heat through the walls is minimized by the rational use of heat-insulating bricks or material.

## Chemical Effects of Atmosphere on Metals.

Those are the main factors and considerations which determine temperature, temperature distribution, and length of flame in the furnace, but there is another side, the chemical side, to the behaviour and importance of the atmosphere in the furnace. The products of combustion are often not inert with reference to the charge itself in the furnace, and the action on the charge may be a very serious consideration. The most obvious case is perhaps when the furnace is used for any sort of metal heating; for example, the heating of steel. To give you an idea of what is involved in practice, I am going to give you a few figures. In 1929 (a good year) the production of steel in Great Britain was approximately 9,500,000 tons with an average price of £8 a ton. In manufacture the loss of every 1% of metal by scaling in the furnace would mean a loss of £760,000. That is a direct loss, but in gauging the total loss by furnace operations, it has to be taken into account that any steel article in the finished condition has of necessity been heated a number of times, each incurring its own loss. Moreover, the direct loss of metal by scaling is not necessarily the most serious loss. You may have increased machining costs, and if you are dealing with a particular forged and shaped article, such as the dome of a locomotive, if the scaling goes beyond a certain point, even locally, it may mean the production of a " waster."

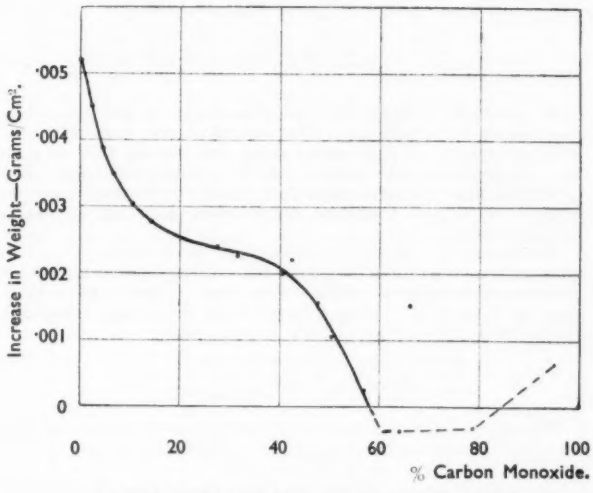



Fig. 3.—Scaling in Mixtures of $CO_2$ and CO.

The extent of this loss by scaling varies widely with the fuel, and the conditions of use, as has been demonstrated completely by experimental work. The variation in the composition of typical fuels and the consequent variation in the products of combustion is shown in Table I. What I want you to notice particularly is the proportion of steam compared with $CO_2$ in the products of combustion. With gaseous fuels, the steam is highest (21·9%) from coal gas

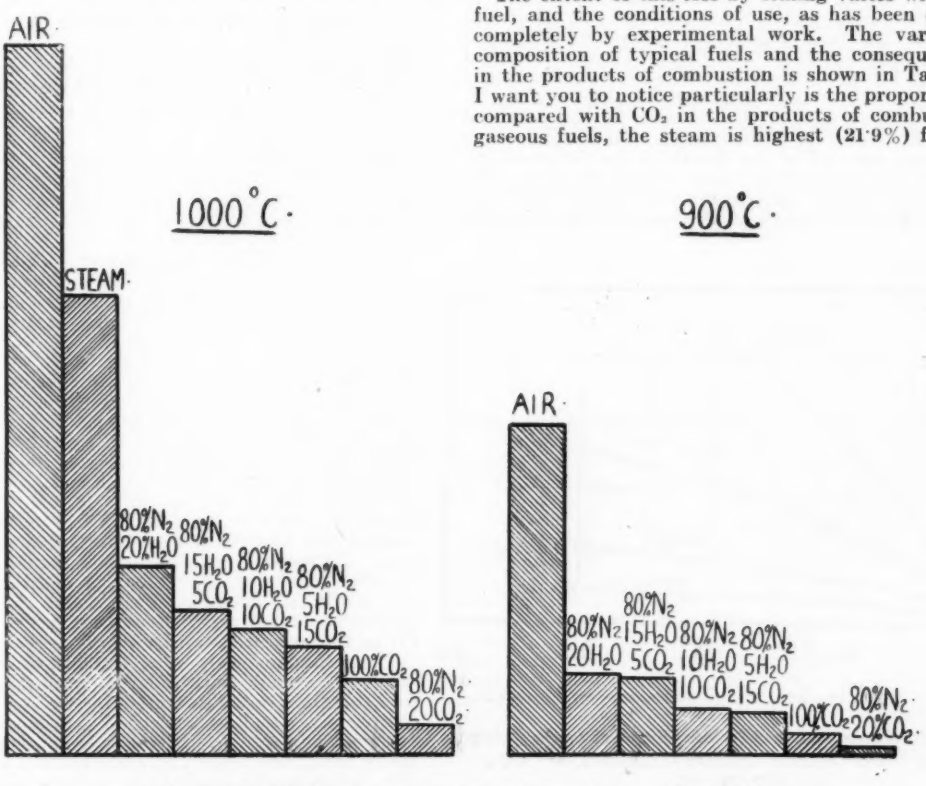



Fig. 4.—Diagram showing Comparative Scaling Effect of Various Atmospheres.

# Furnace Atmospheres and Their Effects

by
Prof. J. W. COBB, C.B.E.

A lecture given before the North of England Gas Managers' Association at their Annual Meeting held at Newcastle-on-Tyne on May 8.

One of the first lectures which I gave outside the University of Leeds after my appointment to the Livesey Professorship was to your Association in 1913. The title of that lecture was "A Problem in Gas-Works Practice," and it dealt with ammonia recovery. My choice of subject on this occasion marks the extended activities of the Gas Industry and the wider meaning which may now be given to Gas Engineering as a description of a profession. It is appreciated that the expansion of the Gas Industry in the future will depend very largely upon the extent to which it can demonstrate the suitability of gas for a wider range of domestic and industrial uses, in addition to maintaining and increasing the value of its services along well-established lines. It is consistent with that idea that I am going to deal with industrial furnaces, and particularly with an aspect of furnace practice which should be scrutinized with the utmost care.

In considering the use of different fuels in heating furnaces, there are three things, apart from calorific value, of primary importance which characterize their behaviour —viz., the temperature attained in the heating space, the distribution of the temperature, and the nature of the atmosphere. To begin with, so far as the temperature is concerned, we may glance with advantage at what is called the theoretical maximum temperature of combustion which can be attained with the fuel in use. That means the temperature which would be attained if the combustion were completed instantaneously and without loss of heat so that all the heat passed into the products of combustion. It depends on the total heat of combustion and the thermal capacity of the products, and indeed is the one divided by the other. For maximum temperature it would also be necessary that the gas and air in the furnace were present in the proportions that were theoretically necessary for complete combustion without any excess either of air on the one hand or combustible gas on the other. Such a calculated temperature of combustion would appear very high. Thus, with hydrogen and air, it would come to 2,160° C., and for a mixture of hydrogen and carbon monoxide in equal proportions (ideal water-gas) the temperature would be 2,230° C., well above the melting point of platinum, and also well above the melting point of the refractory materials used in the construction of furnaces. It is a temperature which, in practice, is not attained in the furnace, mainly because there is always a cooling by radiation from the flame, and also normally by contact with the charge which is being heated in the furnace or the furnace walls. The actual temperature attained in the furnace is highest when the combustion is completed rapidly, so that these losses are minimized. Some combustible constituents of the gas, such as hydrogen, make for rapid combustion, while others, such as the hydrocarbons, tend the other way; but apart from any special characteristics of the gas used rapid combustion will be favoured when the mixing of the gas and air (which must come everywhere into intimate contact for combustion) is completed as quickly as possible. That can be assisted, as it is in a furnace where the burners are of the Bunsen type, by previous mixing of part of the air with the gas, and it can also be aided, mainly in furnaces of the larger kind burning producer gas, by inclining the admission ports to one another, so that the momentum of the gas and of the air assist in inter-penetration of the two streams, and the consequent mixing. The difference in density may also be utilized. The rate of combustion can, moreover, be speeded up if the gas and air are not burned freely in the open but impinge upon a red hot surface of refractory material, or they may even be forced through a hot layer of refractory material. The speeding-up process effected in that way is known as surface combustion. When a short hot flame is obtained by any of these methods, it is good for the production of maximum temperature, and it is usually best for thermal economy, because generating all the heat near the point of entry of the gas and air gives a better opportunity of extracting the heat before it gets to the far end of the furnace and escapes. There are, however, many cases in which delayed instead of accelerated combustion is better for the purpose in hand, because then the flame carries further along the furnace with a more uniform distribution of heat and temperature, which is often a primary requisite of the particular process. This effect may be promoted by the obvious method of delaying the mixing of the gas and air, bringing them into the furnace in such a way that they tend to flow in parallel streams through the furnace, their inter-penetration then being comparatively slow. The same purpose may be served by supplying the gaseous fuel or oil at several points along the length of the furnace.

So far I have been talking about what can be done when the gas and air are supplied in the theoretical proportions for complete combustion, but other conditions are to be considered. Supposing an excess of air is used, the temperature generated is lowered thereby because of the diluting effect of excess of air. Per unit of gas burned, the heat generated is the same, but the diluted products of combustion have a greater thermal capacity, and the temperature is consequently lower. That may be done deliberately, but it often happens from lack of control. Or, supposing an excess of gas is used, the temperature again is lower. Some of the gas travels along the furnace unable to find the air necessary for its combustion. It is another inert substance which simply has to be heated up, and so lowers the temperature. In this case, however, there is another effect to be considered, because some of the gas

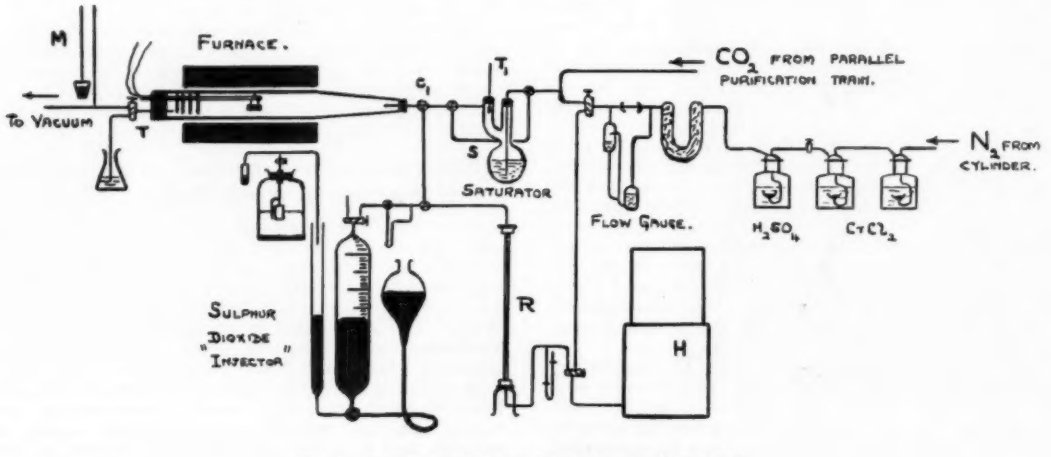



Fig. 1.—Apparatus Used in the Scaling of Mild Steel.

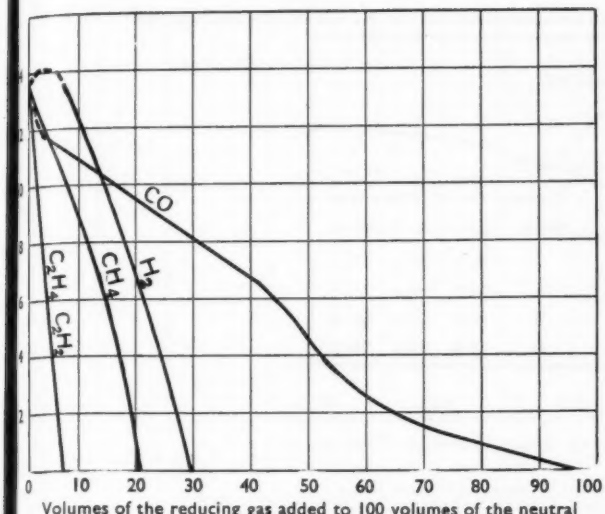

CO
$H_2$
$CH_4$
$C_2H_4$
$C_2H_2$
0 10 20 30 40 50 60 70 80 90 100
Volumes of the reducing gas added to 100 volumes of the neutral furnace atmosphere.

Fig. 7.—Prevention of Scaling by the Addition of Reducing Gases. Neutral Furnace Atmosphere, $CO_2$ 10%, $H_2O$ 10%, $N_2$ 80%.

there was plainly some scaling effected, although small in amount, due to $CO_2$. As soon as steam was introduced the scaling effect was much more pronounced, and as the steam increased so did the scaling. Finally, the result is shown of treatment in air where you get a clear indication that the oxygen of the air has a scaling effect very much greater than comes from the neutral products of combustion.

In fig. 5 is shown the results obtained at different temperatures with a neutral atmosphere containing 10% $CO_2$ and 20% steam, with 70% $N_2$, which is very nearly the atmosphere which would result from the combustion of town gas. It shows clearly how rapidly the scaling effect increased with temperature. The curves form a series of parabolas.

Now as to the prevention of scaling. Fig. 6 shows the results obtained by taking the neutral atmosphere as a starting point, and adding to it on the one hand oxygen in gradually increasing quantities, and on the other hand hydrogen, chosen as a typical reducing gas. As the reducing or combustible gas is increased, the scaling is gradually diminished, and if you go far enough, scaling is eliminated completely. This is in practice, as you know, the way in which scaling is normally lessened, by the use of an excess of combustible gas, and the complete exclusion of free oxygen. It is, however, desirable and necessary to know how much combustible gas would have to be used in order to prevent scaling entirely, and for that purpose experiments were made in turn with carbon monoxide, hydrogen, methane, ethylene, and acetylene, all of which are reducing gases. You will see in fig. 7 the volumes of reducing gas which had to be added to 100 volumes of the neutral furnace atmosphere in order to eliminate scaling. The point to which I want to call your attention is the very large amount of combustible gas which has to be added before this object is attained, or indeed before the scaling is halved. The diagram is, however, a little difficult to interpret in practice, because one volume of such a gas as ethylene represents far more reducing material than one volume of hydrogen or carbon monoxide. For that reason

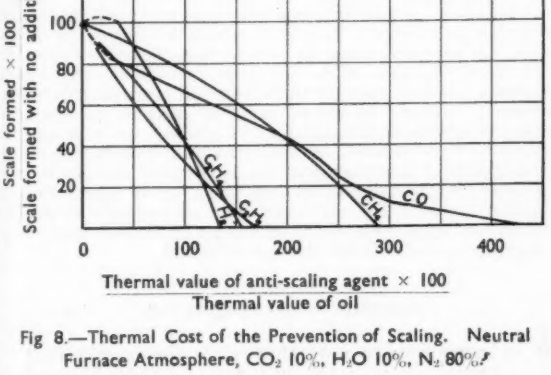



Fig 8.—Thermal Cost of the Prevention of Scaling. Neutral Furnace Atmosphere, $CO_2$ 10%, $H_2O$ 10%, $N_2$ 80%.

in fig. 8 what is plotted is the thermal value of the anti-scaling gas and not its volume. This brings out the interesting result that in order to prevent scaling completely an amount of combustible gas has to be introduced which is greater in thermal value than the original fuel used. Such protection in a furnace by direct contact with all the products of combustion is therefore, thermally, a wasteful process, and so special furnaces have to be designed in which the hot metal is not so much exposed. It may be shielded by a muffle in which can be maintained, if need be, an atmosphere of its own, or other special features of construction may be used. Fig. 9 illustrates I think quite clearly the scaling effects which result from the combustion of town gas in neutral, oxidizing, and reducing conditions. You see that when free oxygen is present there is a tremendous increase in the scaling. On the other hand, if carbon monoxide is added, diminished scaling results although the diminution is only effected slowly so that it requires large quantities of carbon monoxide in order to get a marked anti-scaling effect as compared with that of the neutral atmospheres. Moreover, if the additional scaling due to so much oxygen is plotted, it is seen from fig. 10 that oxygen will produce the same additional scaling, whatever the original neutral atmosphere may be—*i.e.*, whatever the nature of the fuel. There is then no remedy in the choice of fuel for lessening the effect of free oxygen. It is plain that what has to be guarded against by precise control above everything is the presence of free oxygen in the furnace atmosphere. That having been attained, the less hydrogen and more carbon in the fuel the better because in that way less steam and a larger proportion of carbon dioxide in the products of combustion is ensured.

I want next to call attention to one other constituent of the furnace atmosphere, namely, the sulphur dioxide resulting from the combustion of sulphur present in the fuel. Its effects are most remarkable because, although free oxygen is a strong scaling agent, sulphur dioxide is very

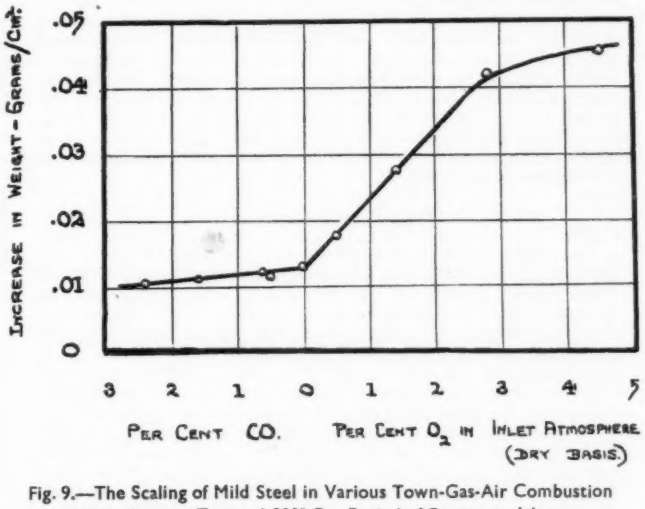



Fig. 9.—The Scaling of Mild Steel in Various Town-Gas-Air Combustion Atmospheres. Temp., 1,000° C. Period of Exposure, 1 hour.

much more powerful. Fig. 11 shows the marked influence of added sulphur dioxide in the neutral atmosphere at 1,000° C. and other temperatures. Note the large increase in scaling resulting from the presence of 0·2% of $SO_2$, which is what you would get from a coal gas which had not been purified by oxide of iron. Lowering the $SO_2$ to 0·1% lessens the scaling, and that can be taken to represent a rough average of the sulphur dioxide resulting from the use of coal and producer gas or fuel oil. Normal oxide purification (to 30 grains) would, however, bring down the sulphur dioxide content of the furnace gases to 0·01%, and you see that under those conditions the diminution in scaling is so great that the results are substantially the same as those obtained from an atmosphere made up without any sulphur at all. Thus, gradual lowering of the sulphur dioxide content in the gases is accompanied by diminution in scaling, but when 0·01% of $SO_2$ has been reached, corresponding with a normally purified coal gas, there appears to be no appreciable advantage as regards scaling in going further. It has been suggested that this influence of sulphur dioxide is very much more marked in a reducing atmosphere, but none of our results would confirm that idea excepting in one special sense, as shown in fig. 12. This shows the comparative scaling results obtained by the addition of oxygen in gradually increasing quantity to two atmospheres, one the neutral furnace atmosphere contain-

TABLE I.—*Products of Combustion of Typical Gaseous Fuels.*

| Gaseous Fuel. | Calorific Value (Gross) B.Th.U. per Cu.Ft. | Composition of Fuel, % by Volume. | | | | | | Composition of Products of Combustion, % by Volume. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $CO_2$. | CO. | CnHm. | $CH_4$. | $H_2$. | $N_2$. | $CO_2$. | $H_2O$. | $N_2$. |
| Coal gas | 481 | 3·0 | 14·0 | 2·0 | 23·5 | 49·5 | 8·0 | 9·5 | 21·9 | 68·6 |
| Producer gas | 148 | 3·8 | 27·2 | .. | 3·1 | 9·7 | 56·2 | 16·9 | 9·4 | 73·7 |
| Mond gas | 151 | 16·0 | 11·0 | .. | 3·0 | 27·0 | 43·0 | 14·8 | 17·8 | 67·4 |
| Blue water-gas | 293 | 4·5 | 40·7 | .. | 0·6 | 49·3 | 4·9 | 16·4 | 19·7 | 63·9 |
| Blast-furnace gas | 89 | 12·0 | 26·4 | .. | .. | 1·5 | 60·1 | 24·8 | 2·6 | 72·6 |

TABLE II.—*Products of Combustion of Typical Liquid and Solid Fuels.*

| Liquid or Solid Fuel. | Calorific Value (Gross) B.Th.U. Lb. | Ultimate Analysis of Fuel (on Dry and Ash-Free Basis). | | | | | Composition of Products of Combustion, % by Volume. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | C. | H. | N. | S. | O. | $CO_2$. | $H_2O$. | $N_2$. |
| Anglo-American fuel oil | 19,000 | 85·2 | 12·7 | 1·1 | 1·0 | .. | 13·5 | 13·2 | 73·3 |
| Bituminous coal: Moisture, 2·0%; ash, 5·0% | 14,400 | 86·0 | 5·5 | 1·0 | 1·5 | 6·0 | 17·0 | 8·0 | 75·0 |
| Low-temperature coke: Moisture, 5·0%; ash, 6·9% | 13,030 | 93·0 | 3·0 | 1·2 | 0·8 | 2·0 | 18·5 | 5·5 | 76·0 |
| Gas coke: Moisture, 5·0%; ash, 6·9% | 12,630 | 95·0 | 1·0 | 1·1 | 0·9 | 2·0 | 19·9 | 3·3 | 76·8 |
| Coke-oven coke: Moisture, 5·0%; ash, 6·9% | 12,500 | 95·7 | 0·3 | 1·1 | 0·9 | 2·0 | 20·8 | 2·5 | 76·7 |
| ,, ,, ; Moisture, 2·0%; ash, 6·9% | 12,900 | 95·7 | 0·3 | 1·1 | 0·9 | 2·0 | 20·5 | 2·0 | 77·5 |

NOTE.—In preparing Tables I. and II. it has been assumed that (1) the air used for combustion is 75% saturated with water vapour at 15°; (2) gaseous fuels are saturated with water vapour at 15°. The combustion of the sulphur present in the fuels has been neglected.

and lowest from blast furnace gas, producer gas and water gas being intermediate. The lowest steam content available in practice (2%) comes from the combustion of coke or of a producer gas made from coke using air-blast. It is assumed that a high-temperature coke containing 2% moisture is used and that the air is three-quarters saturated with moisture.

Bituminous coal and producer gas made from it and oil give more steam, say 10%, on the average, with about the same percentage of $CO_2$. For our experiments, three typical "neutral" atmospheres were made up, representing roughly the range of fuels in use, thus:

$H_2O$ 2%, $CO_2$ 18%, $N_2$ 80% Coke
$H_2O$ 10%, $CO_2$ 10%, $N_2$ 80% Coal or fuel oil
$H_2O$ 20%, $CO_2$ 10%, $N_2$ 70% Coal gas

These atmospheres are only neutral in the sense of containing no excess of oxygen or combustible gas. As will be seen, they are not inert to metal.

In examining the effects of these fuels, the ultimate and most convincing tests would be full-scale working trials, but that would have been impracticable at this stage, partly because the control of large-scale furnaces is not sufficiently precise for our purpose and because, in order to study the problem properly, it was necessary to determine separately the influence of deliberately varying a number of conditions one by one, involving a large number of experiments. For these reasons, we decided on laboratory investigation, and the apparatus used is shown in fig. 1. In each experiment, a small section of a bar of a normal mild steel was heated in a tube furnace, the metal being suspended from the end of the sheath of the thermocouple used for indicating the temperature of the furnace. The treatment was carried out in an atmosphere made up according to requirements, and the increase in weight of the metal was measured after heating, usually for one hour at 1,000° C. The atmospheres were made up synthetically from $CO_2$ and nitrogen and steam, the typical products of combustion. Both the nitrogen and $CO_2$ used were supplied in regulated amounts, and were carefully purified,

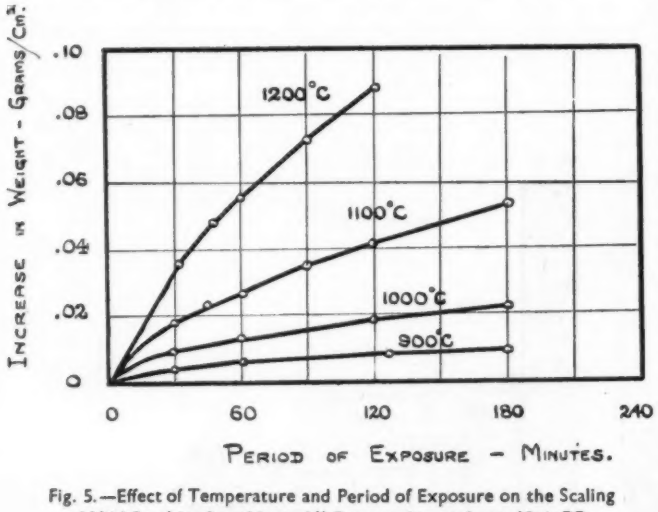



Fig. 5.—Effect of Temperature and Period of Exposure on the Scaling of Mild Steel in the "Neutral" Furnace Atmosphere, 10% $CO_2$, 20% $H_2O$, 70% $N_2$.

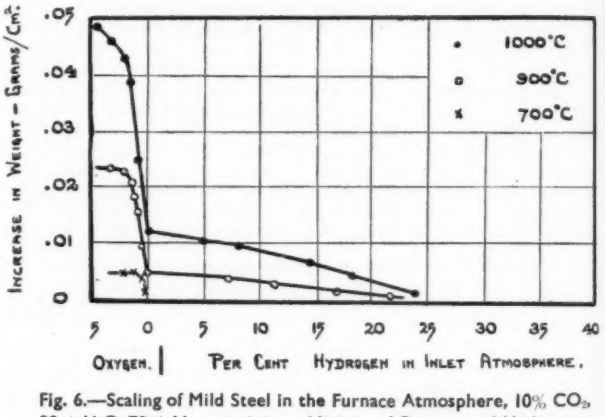



Fig. 6.—Scaling of Mild Steel in the Furnace Atmosphere, 10% $CO_2$, 20% $H_2O$, 70% $N_2$, containing additions of Oxygen and Hydrogen. Period of Exposure, 1 hour.

especially from any excess of oxygen. The steam was supplied by saturating the gas stream at a known temperature. The preliminary heating up was made in nitrogen, which was found to be quite inert, after which the heating process was continued for an hour at the required temperature in the synthetic atmosphere. The cooling off was completed in nitrogen, and the increase in weight determined. Now the reason for this work lies fundamentally in the fact that neither $CO_2$ nor steam in the products of combustion is an inert gas as regards mild steel. You see here the results obtained in fig. 2 by the use of mixtures of steam and hydrogen. The increase in weight is plotted vertically, and there is seen to have been a considerable increase in weight on heating in steam alone. When hydrogen was added, the increase in weight was gradually lessened, but the no-scaling point was not reached until the percentage of hydrogen reached 50%. Steam is therefore not inert, and what one calls the neutral atmospheres—consisting of $CO_2$, steam, and nitrogen, with no excess of oxygen and combustible gas, are not neutral for this purpose. Corresponding experiments made with mixtures of $CO_2$ and CO showed that $CO_2$ attacked the metal, although not nearly so much as steam, and that when CO was gradually added to $CO_2$ it was necessary to go to 48% of CO in the mixture in order to prevent scaling completely.

These fundamentals being established, numerous experiments were made with different atmospheres, and the results obtained are illustrated by fig. 4, which shows the comparative scaling effect of various atmospheres at 1,000° C. and 900° C. Nitrogen is not shown, because it is really inert, but when you come to 80% nitrogen and 20% $CO_2$, which would result from burning pure carbon in air,

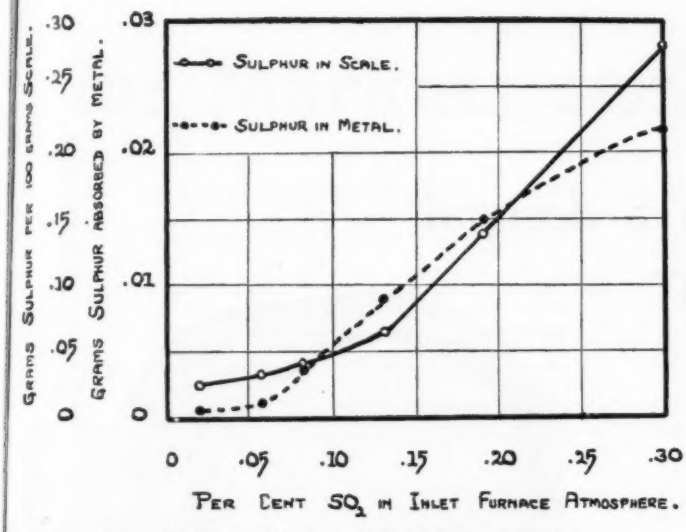



Fig. 13.—Effect of Variation of the Concentration of Sulphur Dioxide on the Fixation of Sulphur by the Metal and Scale. Atmosphere, 10% $CO_2$, 10% $H_2O$, 80 % $N_2$. Period of Exposure, 1 hour. Temp., 1,000° C. Wt. of Metal, 15 grammes.

Fig. 14.—Eutectic Between Metal Grains.

similar lines has been carried out by the American Gas Association Research Fellow, Mr. A. P. Watts, entitled "The Effect of Furnace Atmospheres on the Quality of Certain Types of Glazes." America has also been represented in the investigations on the scaling of metals by the work of Jominy, Murphy, and Upthegrove, so that the recognition of the importance of studying furnace atmospheres and their effects is not limited to this country.

It will be plain from all that I have said that for the best results it is necessary to determine by careful observation and experiment the conditions that are best suited for the particular furnace operation involved, which differ widely. The fuel and furnace used should then be such that the proper conditions can be reached and maintained with precision. A washed, purified coal gas offers such advantages in these directions that the Gas Industry ought to find great and increasing opportunities in this field of work, but plainly it can only reap the full harvest if its members bring to bear upon the work the understanding of furnace operations which will render possible effective co-operation with the members of other industries, each with its own technique.

## Gas at the Bath and West Show

### Neath, May 27 to 30

Last week we gave pictures, and a few brief notes, of the fine gas exhibit which was staged at the Show this year. We are indebted to Mr. W. Clark Jackson, Hon. Secretary of the District Executive Board for South Wales of the N.G.C., for the following additional particulars:

The Management Committee of the above Board, when it was reported to them that the Bath and West and Southern Counties Society Agricultural Show was to be held at Neath from May 27 to 30, felt that the Gas Industry ought to be represented by some type of Joint Gas Exhibit. The co-operation of the British Commercial Gas Association and the British Road Tar Association was therefore invited, and a strong local Sub-Committee was set up. As a result, the Joint Gas Exhibit was one of the features of the Show.

The exhibits included a replica of the King's House Kitchen, continuous washing and ironing demonstrations being a feature in the kitchen itself; the hot water section, where the latest types of domestic hot water appliances were shown; the industrial section, comprising a gas-fired steam boiler, Kohler electric generating sets, gas-fired milk bottle sterilizer, gas-heated egg incubator, &c., &c. There was also a display of cookers, gas fires, wash boilers, &c.

To illustrate the safety and non-skid properties of tarred roads, a panoramic photograph of a tarred road in a country setting was shown, together with a section of actual tarmacadam roadway.

The Exhibit was floodlit from a hidden source by means of special spot light lamps, and the lady attendants, comprising the Gas Department's Lady Maintenance Inspectors and Showroom Attendants, were dressed in dainty smocks. The B.C.G.A. supplied an artist, Miss Graves, whose humorous sketches were one of the major attractions of the whole Show.

The attendance was over 63,000 drawn from all over the country. Over 40,000 people passed through the Local Industries Section, where the gas exhibit showed a "full house" each day. Over 300 firm enquiries for various classes of appliances were booked from people living as far apart as Canterbury and Pembroke Dock. Each Gas Undertaking concerned had copies of these enquiries sent on.

The Management Committee of the District Executive Board take this opportunity of thanking all those who co-operated in making this Joint Gas Exhibit one of the finest seen outside of London. Particularly would they thank Mr. Oliver and Mr. Pryer, of the B.C.G.A., their Artist, Miss Graves, the Managing Council of the British Road Tar Association, the local Sub-Committee, the Chairman and Members of the Neath Corporation Gas Committee, together with the members of the Gas Department's Staff.

The Firms who co-operated on the Stand were as follows: Messrs. Bratt Colbran, Ltd., W. H. Dean & Son, Ltd., Ideal Boilers and Radiators, Ltd., Electrolux, Ltd., Ascot Gas Water Heaters, Ltd., Forth and Clyde and Sunnyside Iron Companies, Ltd., John Harper & Co., Ltd., Kohler Company, Ltd., Calor Gas (Distributing) Company, Ltd., British Road Tar Association, G. S. Clayton, Spratt's Patent, Boro' Dairy Laboratories and Appliance Company, Ltd., Wm. Sugg & Co., Ltd., Wm. Douglas & Co., Falk, Stadelmann, & Co., Ltd., Cochran & Co., Annan, Ltd., Selas Gas and Engineering Company, Ltd.

The following points may be of some little interest:

(1) The large notice board in front of the showgrounds has been floodlit by gas since the beginning of the year.

(2) The largest catering firm on the grounds, Messrs. William Hancock & Co., Ltd., Cardiff, used gas exclusively for their cooking, boiling of water for tea, coffee, &c., and provision of water for washing-up purposes.

(3) An amusing incident again proved the utility of gas—one of the attendants fell into a water pond and without any hesitation his chums, after wrapping him up in a horse blanket, made their way to the Joint Gas Exhibit Stand for the purpose of getting his clothes cleaned and dried. This was done by the chief Lady Demonstrator in the kitchen, the whole of the man's clothes being given a wash, and dried in the gas-heated drying cabinet, and afterwards pressed and ironed by means of a gas iron.

(4) Gas was also used extensively by various other stands, including the stand of the Anglo-American Oil Company, where a number of laboratory routine tests were being continually carried out, and where gas bunsen burners were used.

Gas was also used for gas-driven Kohler electric generating sets, one of them being on a tinplate stand for driving machinery.

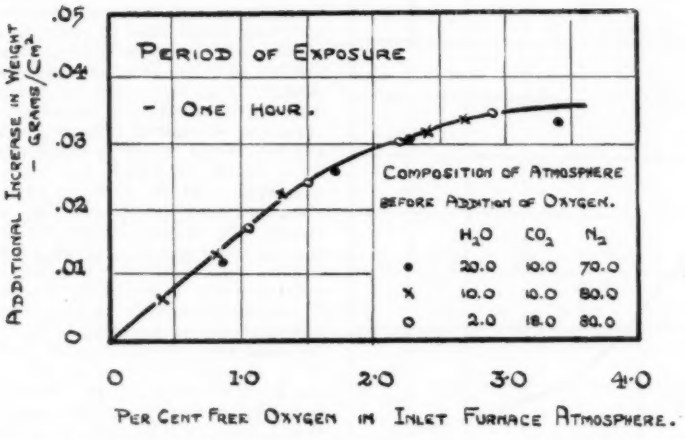



Fig. 10.—Additional Scaling Produced by the Addition of Oxygen to Various "Neutral" Furnace Atmospheres. Temp., 1,000° C.

ing 0·3% $SO_2$ (the upper continuous curve), and the other the same atmosphere without $SO_2$ (the lower curve). It will be noticed that when the free oxygen present had risen to about 3%, the scaling was the same, whether $SO_2$ was present or not. Thus, the advantage obtained by freedom from $SO_2$ was lessened by the presence of free oxygen, and lost altogether when the oxygen reached 3%.

I have so far been dealing solely with the effect of sulphur dioxide and other gases on scaling, but the evil influence of sulphur often displays itself in other and more serious ways. It will be seen from fig. 13, where results are plotted showing the amounts of sulphur fixed in the metal and the scale. the quantities being determined by chemical analysis, that such fixation has to be reckoned with. A sulphur-containing eutectic appears to be formed, shown highly magnified in the broken pattern in fig. 14, which eutectic forces itself between the boundaries of the metal grains, shown white and continuous. Such a structure is known to be unsatisfactory because of its want of cohesion, and is responsible for the condition known as "red-shortness."

## Glazes and Enamels.

The experiments described above were made on a normal mild steel and have already been extended to other steels with similar results in our laboratory at Leeds, while information has also been forthcoming from the study of non-ferrous metals. (See Review of Scaling of Metals by Department of Scientific and Industrial Research.) It is plain that the subject has great industrial importance and that the choice and control of furnace atmosphere in relation to metal heating will well repay detailed study.

It will have been noted in what has been said about the scaling of metals that the exclusion of oxygen is all-important and the presence of incombustible gas is helpful. In other furnace operations, however, the reverse is true. The desirable atmospheric condition has to be ascertained in relation to the particular operation. This principle may be exemplified by the furnacing of glazes and enamels. There the presence of any unburnt gas in contact with the glaze is fatal. Hydrocarbons decompose with the formation of some free carbon which becomes embedded in the enamel or the body below it. It is almost impossible to burn this carbon out again, so that the ware is blackened and, even if the free carbon does burn out to some extent, it produces bubbles, blisters, and a roughened surface. On the other hand, some free oxygen is a positive advantage since the glazed surface obtained is brighter. Where coloured glazes are being made a different and undesirable result is usually forthcoming if the atmosphere becomes reducing. The presence of sulphur compounds is harmful at times, producing defects even when the atmosphere is oxidizing and in all other respects suitable for good results. Glazes are complex silicate mixtures and generally speaking those melting at lower temperatures contain more bases such as alkali and lime and are more liable on that account to be attacked by the furnace gases, particularly by steam and sulphur dioxide. For that reason many of them are always in practice fired in muffle furnaces in which the products of combustion do not come into free contact with the glaze. It is moreover to be remembered that in works practice the firing of glazed ware is usually a prolonged process in which both heating and cooling are of necessity conducted very slowly, in order to avoid such defects as the cracking of the ware and the crazing of the glaze. On this account the laboratory investigation of glaze defects is extraordinarily difficult, many of them being due to slow processes of crystallization, which it is almost impossible to reproduce under laboratory conditions.

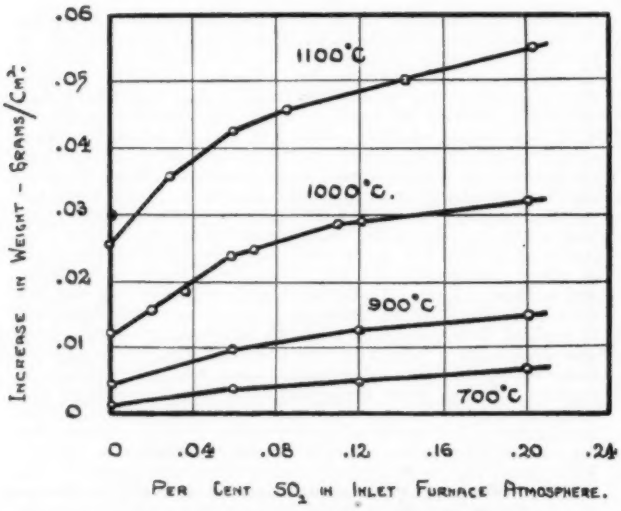



Fig. 11.—Effect of Sulphur Dioxide on the Scaling of Mild Steel in the "Neutral" Furnace Atmosphere, 10% $CO_2$, 20% $H_2O$, 70% $N_2$.

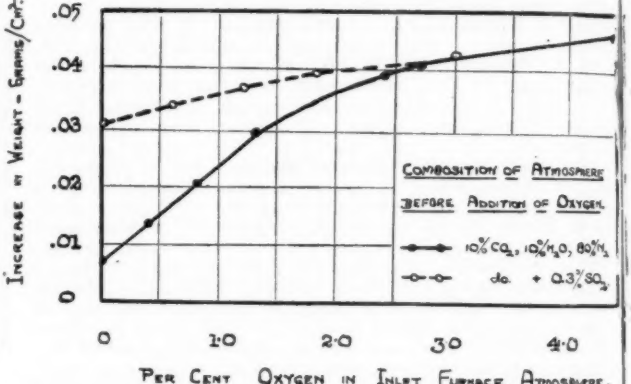



Fig. 12.—Scaling of Mild Steel in Sulphur-Free and Sulphur-Containing Furnace Atmospheres Containing Additions of Free Oxygen. Temp., 1,000° C. Period of Exposure, 1 hour.

## American Investigations.

It is interesting to note that while the most recent results reported above on the influence of furnace atmosphere on steel were obtained in Leeds by the Institution Gas Research Fellow, Dr. Millett, a laboratory investigation on

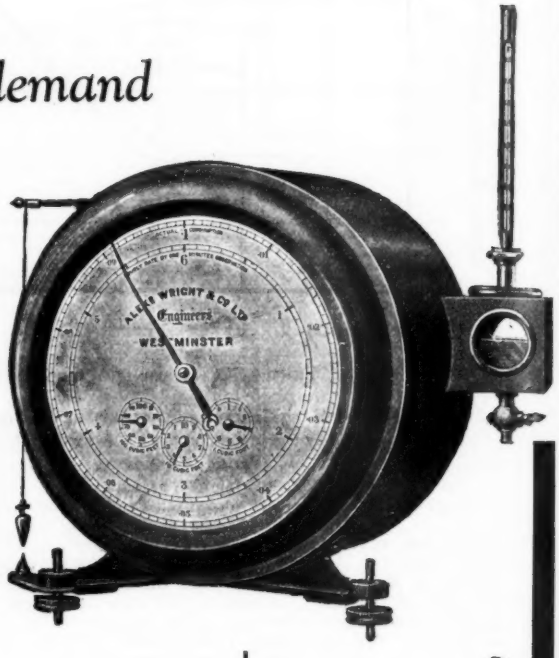
LABORATORY TESTS *demand*

**ACCURATE MEASUREMENT**
*of* **GAS VOLUME**

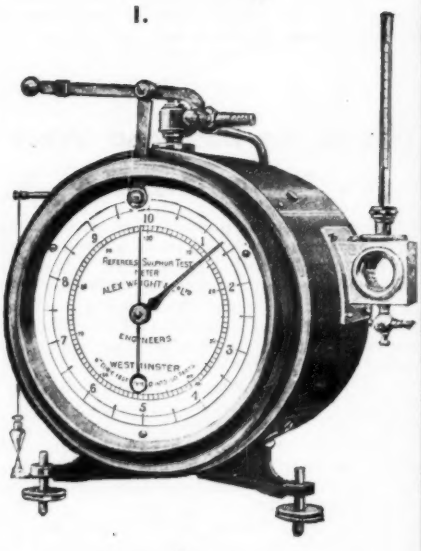
# WRIGHT'S METERS

***are ACCURATE***

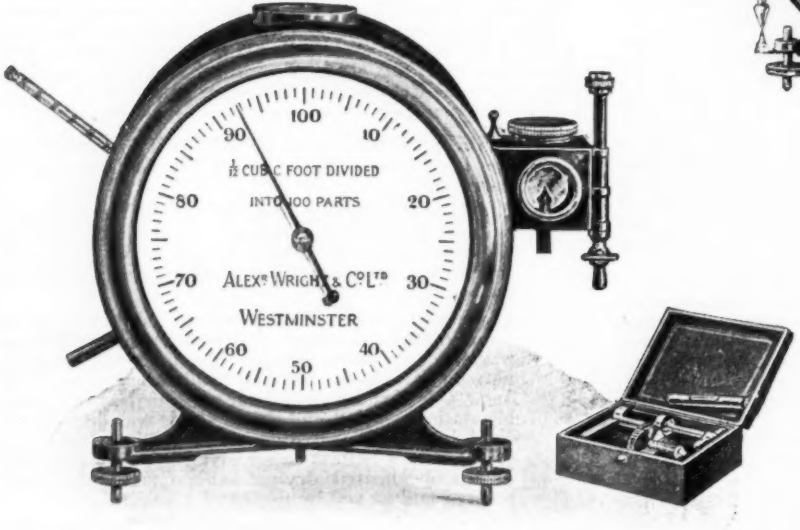
The accuracy and quality of Wright's Meters result from the experience gained over 90 years, and may be judged from the fact of their use by laboratory workers in hundreds of industrial, scientific, and government laboratories, and for such vital services as measurement of air supplies to divers and in physiological investigations.




1.




2.




3.

1. Laboratory Gas Meter: 1/10th cu.ft. to 1½ cu ft. per revolution (or metric equivalents), with or without indices.

2. Automatic Stop-action Meter: 1/12th cu.ft. per revolution, or to special requirements.

3. "Hyde" Modified Ordinary Meter: As used with Boys' non-recording Gas Calorimeter.

**ALEXANDER WRIGHT & CO., LTD., WESTMINSTER**

# Gas Markets and Manufactures

## Stock Market Report

**(For Stock and Share Lists, see later pages)**

As was anticipated, with the Whitsun holiday and the three-week account over, business on the Stock Exchange last week took a decided turn for the better. It is true the situation in France still looms in the background, but the renewal of confidence in home affairs was sufficient to combat the effect of the financial and political troubles abroad. Under the lead of British Funds, which were doubtless assisted by support from French investors, quotations in practically all sections improved, and though the inevitable bouts of profit-taking took place, the position was strong enough to withstand any reactions on this account, prices finally closing appreciably higher than a week ago.

The Gas Market also shared in the general conditions as regards the volume of business, but except in a few instances quotations remained unaltered. On the London Exchange, a feature was the sharp rise of 7 points in Winchester Water and Gas ordinary to 124½, while Portsmouth 5% maximum and Southampton 4% debenture both gained 2 points. It will be noticed that a parcel of Alliance and Dublin stock changed hands at 165 though the quotation continues to stand at 150-160. Apart from the usual *ex* interest markings at this time of the year, the only set-back of note was a further fall of 2 in Commercial ordinary to 97½, yielding on a 5% dividend £5 2s. 6d.%. This is a high return on the stock of a Metropolitan Company, and a purchase at round about this figure should turn out a profitable investment. In the Supplementary List, rises of 10 and 7 points respectively took place in Eastbourne "A" and "B" stocks, and Southgate and District gained 5 to 155½. At these higher prices the yields on these stocks is still over 4½%. The Gas Light new debenture made a fractional improvement to 103½.

The report and accounts of the Plymouth and Stonehouse Gas Light and Coke Company for the year to March 31 last show that the Company has had a most successful year's working. The gross profit is £62,468 against £48,095, and, after providing for debenture interest, a transfer of £7,500 (against £1,000) to the renewal fund, and the half-year's dividend to Sept. 30, 1935, at the undermentioned rate, the balance availablt is £49,087, from which the Directors are recommending a dividend for the half-year to March 31 of £8% per annum on the ordinary stock, 13s. 6d. per share on the additional shares, and 13s. per share on the new shares (the same rates as a year ago). This will absorb £19,340, leaving £29,747 to be carried forward as compared with £23,738 in 1935. The report states that fresh records were created in the sales of gas and appliances. The ordinary stock was marked *ex* div. last week at 163-168, and at the middle market price the yield on the above dividend works out at £4 16s. 8d.%.

## Current Sales of Gas Products

### The London Market for Tar Products.

*June* 15.

There are no changes to report in the prices of tar products, which remain as quoted on the 8th instant—namely:

Pitch is nominal at about 37s. 6d. per ton f.o.b.

Creosote, 5½d.

Refined tar, 3⅜d.

Pure toluole, about 2s. 6d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 8d.; and 90/160 pyridine, about 4s. 3d. to 4s. 6d.—all per gallon naked at makers' works.

### Tar Products in the Provinces.

*June* 15.

The average prices of gas-works products during the week were: Gas-works tar, 20s. 3d. to 25s. 3d. Pitch—East Coast, 35s. to 37s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 35s. to 37s. 6d.* Toluole, naked, North, 2s. 2d. to 2s. 4d. Coal-tar crude naphtha, in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 1½d. to 1s. 2½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅜d. to 4⅞d.; low gravity, 4⅜d. to 4⅝d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 2s. 4d. to 2s. 6d. Naphthalene, £22 to £24. Salts, 100s. to 105s., bags included. Anthracene "A" quality, 3d. to 3½d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

### Tar Products in Scotland.

GLASGOW, *June* 13.

Prices are well maintained in this district and the finer products are still most difficult to secure.

Crude gas-works tar.—The actual value is 34s. to 35s. per ton *ex* works in bulk.

Pitch.—There is little interest being shown in this product but quotations remain at 32s. 6d. to 35s. per ton f.o.b. Glasgow for export, and about 32s. 6d. per ton *ex* works in bulk for home trade.

Refined tar.—Throughput is lower than anticipated but quotations are steady at 3d. to 3¼d. per gallon f.o.r. for export, and 3¾d. to 4d. per gallon *ex* works in buyers' packages for home trade.

Creosote oil.—A fair volume of business has taken place and the following can be taken as current prices: B.E.S.A. Specification, 5¼d. to 5⅜d. per gallon; low gravity, 5¼d. to 5½d. per gallon; neutral oil, 5¼d. to 5⅜d. per gallon; all *ex* works in bulk.

Cresylic acid.—Supplies are still definitely scarce with prices firm as follows: Pale, 97/99%, 2s. to 2s. 2d. per gallon; dark, 97/99%, 1s. 10d. to 2s. per gallon; pale, 99/100%, 2s. 5d. to 2s. 9d. per gallon; all *ex* works in buyers' packages.

Crude naphtha.—Available supplies command 5¼d. to 5⅜d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 5½d. to 1s. 6½d. per gallon, and 90/190 heavy naphtha is 1s. 1d. to 1s. 2d. per gallon.

Motor benzole is quietly steady at 1s. 3½d. to 1s. 4d. per gallon.

Pyridines.—90/160 grade is 5s. to 5s. 6d. per gallon, and 90/140 grade is 5s. 6d. to 6s. per gallon.

### Benzole Prices.

These are considered to be the market prices for benzole at the present time:

| | s. | d. | | s. | d. | |
|---|---|---|---|---|---|---|
| Crude benzole | 0 | 8½ | to | 0 | 9 | per gallon at works |
| Motor " | 1 | 2 | " | 1 | 2½ | " " " |
| 90% " | 1 | 3 | " | 1 | 3½ | " " " |
| Pure " | 1 | 7 | " | 1 | 7½ | " " " |

## Contracts Advertised To-Day

**Coal.**

Clitheroe Gas Department. [p. 846.]

East Dereham Urban District Council. [p. 846.]

Skegness Gas Department. [p. 846.]

**Gasholder, &c.**

Rawmarsh Urban District Council. [p. 846.]

**Pipes, &c.**

Ashford (Kent) Gas Department. [p. 846.]

## Trade Notes

### Leeds Office for Smith Meters, Ltd.

Messrs. Smith Meters, Ltd., having appointed Mr. W. R. Gill as their Northern Sales Manager, have opened offices at Nos. 3 and 4, East Parade, Leeds (Telephone No. 23726), and will be glad if their northern customers will make a note of this in order to obtain quick service.

### Vibrating Screens.

From Messrs. Pegson, Ltd., of Coalville, Leicestershire, we have received a copy of their latest leaflet dealing with their vibrating screens, for handling sand, gravel, crushed stone, coal, and coke. The leaflet is fully illustrated and provides a useful reference to the many duties which Pegson screens can efficiently and economically perform.

## Gas Undertakings' Results

### Darwen.

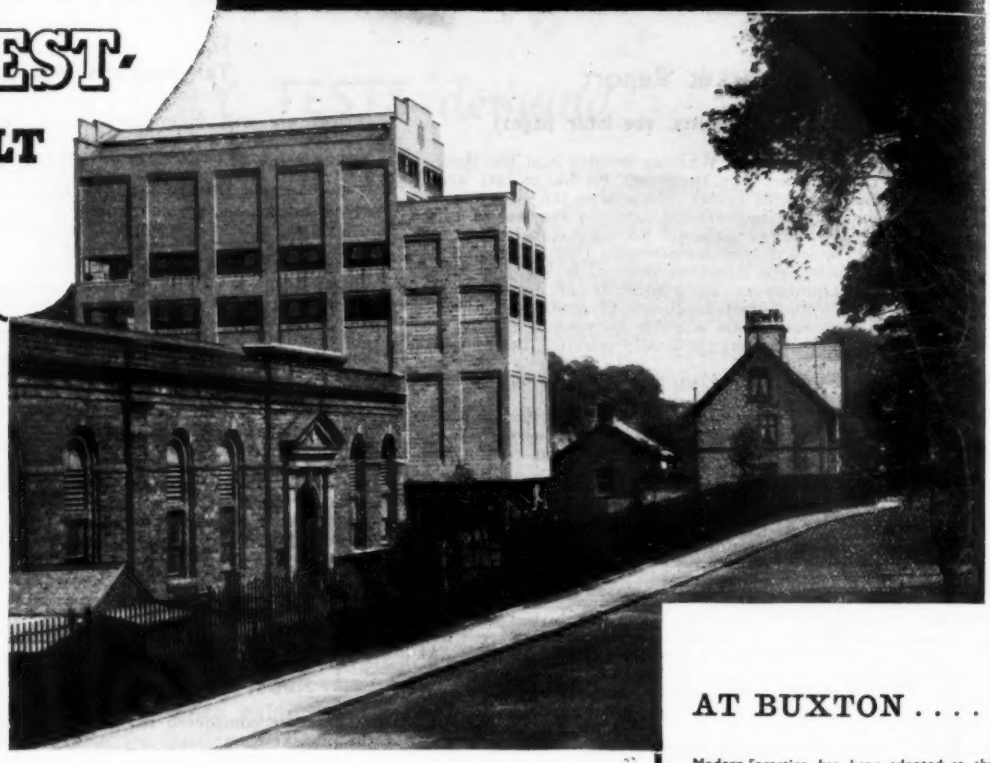
Darwen's Gas Department records a net profit last year of £6,345—an increase of £479 on the previous year, while the credit balance increased from £7,390 to £12,435. Over 1,000,000 more cu.ft. of gas were sold, and the coal carbonized yielded an increase of 652 cu.ft. of gas per ton.

### Warrington.

By an unfortunate misunderstanding the figures given in the "JOURNAL" last week relating to the Warrington Gas Department were for the year ended March 31, 1935, and not, as stated, for the year ended March 31, 1936.

MODERN PRACTICE AT ITS BEST

WEST-BUILT



AT BUXTON . . . .

Modern practice has been adopted at the works of the Buxton Corporation Gas Department in the form of the new Glover-West vertical retort installation and coke cutting and grading unit illustrated above. The plant comprises eight retorts and began service toward the end of 1935. Breeze-burning producer equipment and a waste-heat recovery unit are incorporated.

**Since the 1935 Institution Meeting carbonizing plants of WEST design and construction have been started up or put in hand in Gt. Britain and Ireland, Australia, S. Africa, Denmark, France, and Spain.**

New Installations of Glover-West verticals have been put into commission for the **Llanelly** Gas Light Company, the **Stratford-upon-Avon** Corporation Gas Department, the **Slough** Gas and Coke Company, the **Kilsyth** Corporation Gas Department and the **Buxton** Corporation Gas Department, and extensions to similar plants for the **Buckhaven and Leven** Gas Commissioners, the **Montrose** Gas Company, Ltd., the **Manchester** Corporation Gas Department (Rochdale Road Station), the **Johannesburg** Municipal Gas Department and the **St. Helens** Corporation Gas Department. Installations of Westvertical chambers have been put into service for the **Watford and St. Albans** Gas Company and the **Willenhall** Gas Company.

Orders for Glover-West Vertical Retort plants received since the 1935 Institution Meeting are in hand for the Gas Undertaking of **Mataró**, Spain, the **Newry** U.D.C. Gas Department, the Gas Undertaking of **Vannes**, France (3rd order), the Gas Undertaking of **Tarbes**, France (2nd order), the **South Brisbane** Gas Company, Australia (2nd order), the **Salford** Corporation Gas Department (2nd and 3rd orders), the **Wellingborough** Gas Light Company, Ltd., the **Romford** Gas Company (5th order), the **Dudley**, Brierley Hill and District Gas Company (3rd order), the **Kelso** Gas Company, Ltd., the **Altrincham** Gas Company, the **Bilston** Gas Light and Coke Company (2nd order), the **Grangemouth** Corporation Gas Department (2nd order), the **Johannesburg** Municipal Gas Department (3rd order), the **Ballymena** U.D.C. Gas Department (2nd order), and the **Yeadon** and **Guiseley** Gas Company (2nd order).

# THE WEST SYSTEMS

GLOVER-WEST VERTICAL RETORTS • WESTVERTICAL CARBONIZING CHAMBERS • WEST FUEL PLANTS

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: Albion Ironworks, Miles Platting — Phone: COLLYHURST 2961 — Grams: "STOKER, MANCHESTER"

LONDON: Columbia House, Aldwych, W.C.2 — Phone: HOLBORN 4108 — Grams: "WESGASCO, ESTRAND, LONDON"

MEMBERS OF THE SOCIETY OF BRITISH GAS INDUSTRIES.

# STOCK AND SHARE LIST

## Official Quotations on the London Stock Exchange

| Issue. £ | Stock or Share | When ex-Dividend. | Dividends. Prev. Hf. Yr. % p.a. | Dividends. Last Hf. Yr. % p.a. | NAME. | Quotations June 12. | Rise or Fall on Week | Transactions, Lowest and Highest Prices During the Week. |
|---|---|---|---|---|---|---|---|---|
| 1,767,439 | Stk. | Mar. 16 | 7 | 7⅛ | Alliance & Dublin Ord. ... | 150—160 | ... | 165 |
| 374,000 | ,, | Dec. 16 | 4 | 4 | Do. 4 p.c. Deb. ... | 95—100 | ... | ... |
| 557,655 | ,, | Feb. 17 | 7 | 7 | Barnet Ord. 7 p.c. ... ... | 167—172 | ... | ... |
| 300,000 | I | Mar. 30 | 1/4½ | 1/9½ | Bombay, Ltd. ... ... ... | 1¼—1½ | ... | 27/—27/6 |
| 179,305 | Stk. | Mar. 2 | 9½ | 9½ | Bournemouth sliding scale ... | 218—228 | ... | ... |
| 590,407 | ,, | ,, | 7 | 7 | Do. 7 p.c. max. ... | 170—175 | ... | 171 |
| 493,960 | ,, | ,, | 6 | 6 | Do. 6 p.c. Pref. ... | 148—153 | ... | 150½ |
| 50,000 | ,, | Dec. 16 | 3 | 3 | Do. 3 p.c. Deb. ... | 85—90 | ... | ... |
| 262,025 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. ... | 105—110 | ... | ... |
| 335,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... | 125—130 | ... | ... |
| 357,900 | ,, | Feb. 17 | 7½ | 7½ | Brighton, &c., 6 p.c. Con. ... | 170—175 | ... | ... |
| 649,955 | ,, | ,, | 6¾ | 6¾ | Do. 5 p.c. Con. ... | 155—160 | ... | ... |
| 205,500 | ,, | ,, | 6 | 6 | Do. 6 p.c. 'B' Pref. | 144—149 | ... | ... |
| 855,000 | ,, | Mar. 2 | 7 | 8 | British Ord. ... ... ... | 158—163 | ... | 160 |
| 100,000 | ,, | June 8 | 7 | 7 | Do. 7 p.c. Pref. ... ... | 151—156* | −2 | ... |
| 350,000 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. 'B' Cum. Pref. | 108—113* | −2 | ... |
| 120,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 95—100* | −1 | 97—98 |
| 450,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 105—110* | −2 | ... |
| 200,000 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. Red. Deb. ... | 97—99* | −1 | ... |
| 100,000 | 10 | 22 May '33 | 6 | 4 | Cape Town, Ltd. ... ... | 1—3 | ... | ... |
| 100,000 | 10 | 6 Nov. '33 | 4½ | 4½ | Do. 4½ p.c. Pref. ... | 1—3 | ... | ... |
| 150,000 | Stk. | Jan. 6 | 4½ | 4½ | Do. 4½ p.c. Deb. ... | 81—86 | ... | ... |
| 626,860 | ,, | Feb. 3 | 6 | 6 | Cardiff Con. Ord. ... ... | 130—135 | ... | ... |
| 237,860 | ,, | June 8 | 5 | 5 | Do. 5 p.c. Red. Deb. | 108—113* | −2 | ... |
| 98,936 | I | Apl. 20 | 2/- | 2/- | Colombo, Ltd., Ord.... ... | 1⅜—1⅞ | ... | ... |
| 24,500 | I | ,, | 1/4½ | 1/4½ | Do. 7 p.c. Pref. ... | 20/—22/- | ... | ... |
| 609,204 | I | Mar. 30 | -/11·48 | -/11·48 | Colonial Gas Assn. Ltd. Ord. | 18/—20/- | -/6 | ... |
| 296,053 | I | ,, | 1/3·30 | 1/3·30 | Do. 8 p.c. Pref | 22/—24/- | -/6 | ... |
| 1,775,005 | Stk. | Feb. 3 | 5 | 5 | Commercial Ord. ... ... | 95—100 | −2 | 96—97 |
| 620,000 | ,, | June 8 | 3 | 3 | Do. 3 p.c. Deb. ... | 84—89* | −1 | 85½—86½ |
| 286,314 | ,, | Feb. 17 | 5 | 5 | Do. 5 p.c. Deb. ... | 120—125 | ... | 124 |
| 807,560 | ,, | ,, | 7 | 7 | Croydon sliding scale ... | 158—163 | ... | 161½—162½ |
| 644,590 | ,, | ,, | 5 | 5 | Do. max. div. ... ... | 115—120 | ... | 117½—118½ |
| 620,385 | ,, | Dec. 16 | 5 | 5 | Do. 5 p.c. Deb.... ... | 121—126 | ... | ... |
| 239,000 | ,, | Feb. 3 | 5 | 5 | East Hull Ord. 5 p.c.... ... | 107—110 | ... | ... |
| 184,555 | ,, | Feb. 17 | 6 | 6 | East Surrey Ord. 5 p.c. ... | 130—135 | ... | ... |
| 176,211 | ,, | June 8 | 5 | 5 | Do. 5 p.c. Deb. ... | 120—125* | −2 | ... |
| 19,284,128 | ,, | Feb. 3 | 5⅜ | 5⅜ | Gas Light & Coke 4 p.c. Ord. | 27/9—28/9a | ... | 27/10½—28/4½ |
| 2,600,000 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. max.... ... | 90—93 | ... | 90½—92 |
| 4,477,106 | ,, | ,, | 4 | 4 | Do. 4 p.c. Con. Pref. ... | 105—108 | ... | 107½—108 |
| 8,602,497 | ,, | May 18 | 3 | 3 | Do. 3 p.c. Con. Deb. ... | 87—90* | ... | 88—89 |
| 3,642,770 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 115—118* | ... | 117½—117¾ |
| 3,500,000 | ,, | ,, | 4½ | 4½ | Do. 4½ p.c. Red. Deb. ... | 113—116* | ... | 114¾ |
| 270,466 | ,, | Feb. 17 | 6 | 6 | Harrogate New Cons. ... | 130—135 | ... | ... |
| 157,500 | I | Mar. 16 | 1/7½ | 1/7½ | Hongkong & China, Ltd. ... | 1⅝—1⅞ | ... | 25/- |
| 213,200 | Stk. | Mar. 2 | 6 | 6 | Hornsey Con. 3½ p.c. ... | 135—140 | ... | 138½ |
| 5,600,000 | ,, | May 18 | 8 | 12 | Imperial Continental Cap. ... | 152—157 | +1½ | 152—156 |
| 223,130 | ,, | Jan. 20 | 3½ | 3½ | Do. 3½ p.c. Red. Debs. | 92—97 | ... | ... |
| 285,242 | ,, | Feb. 17 | 8½ | 8½ | Lea Bridge 5 p.c. Ord. ... | 175—180 | ... | ... |
| 165,736 | ,, | Mar. 16 | 8 | 10 | Maidstone 5 p.c. Cap. ... | 180—190 | ... | ... |
| 63,480 | ,, | Dec. 16 | 3 | 3 | Do. 3 p.c. Deb. ... | 80—85 | ... | ... |
| 75,000 | ,, | May 18 | †10 | †10 | Malta & Mediterranean ... | 195—205 | ... | ... |
| 392,000 | — | Apl. 1 | 5½ | 5½ | Metropolitan (of Melbourne) 5½ p.c. Red. Deb. ... ... | 102—107 | ... | ... |
| 231,978 | Stk. | Feb. 17 | 5 | 5 | M.S. Utility 'C' Cons. ... | 110—115 | ... | 112 |
| 818,657 | ,, | ,, | 4 | 4 | Do. 4 p.c. Cons. Pref. | 102—107 | ... | 105¾ |
| 360,075 | ,, | Dec. 16 | 4 | 4 | Do. 4 p.c. Deb. ... | 103—108 | ... | 106—107½ |
| 148,955 | ,, | ,, | 5 | †5 | Do. 5 p.c. Deb. ... | 123—128 | ... | ... |
| 125,000 | — | Jan. 2 | 3½ | 3½ | Do. 3½ p.c. Rd. Rg. Bds. | 99—102 | ... | ... |
| 675,000 | Stk. | Nov. 18 | †3 | †3 | Montevideo, Ltd. ... ... | 70—75 | ... | 71 |
| 225,000 | ,, | Feb. 17 | 7½ | 7½ | North Middlesex 6 p.c. Con. | 169—174 | ... | 171½ |
| 396,160 | ,, | Feb. 3 | 5 | 5 | Northampton 5 p.c. max. ... | 108—113 | ... | ... |
| 300,000 | ,, | Apl. 20 | †9 | †7 | Oriental, Ltd.... ... ... | 165—170 | ... | 169 |
| 416,617 | ,, | June 8 | 8 | 8 | Plymouth & Stonehouse 5 p.c. | 163—168* | −3 | ... |
| 504,416 | ,, | Feb. 3 | 8¼ | 8¼ | Portsmouth & Gosport Cons. | 170—175 | ... | ... |
| 241,446 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... | 110—115 | +2 | 110 |
| 73,350 | ,, | Feb. 17 | ... | 5 | Do. 5 p.c. Pref. ... | 130—135 | ... | ... |
| 114,000 | ,, | Feb. 3 | 5 | 5 | Preston 5 p.c. Pref. ... ... | 110—115 | ... | ... |
| 355,698 | I | Apl. 20 | 1/- | 1/- | Severn Val. Gas Cor. Ld. Ord. | 20 6—22 6 | ... | 21/9—22/3¾ |
| 454,510 | I | Mar. 16 | -/10½ | -/10½ | ,, ,, 4½ p.c. Cum. Pref. | 21/—23/- | ... | 21/10½—22/3 |
| 133,201 | Stk. | Feb. 17 | 8½ | 5 | Shrewsbury 5 p.c. Ord. ... | 147—152 | ... | ... |
| 90,000 | 10 | June 8 | †3½ | †4 | South African... ... ... | 3¾—4¾* | −¼ | 4 |
| 1,106,173 | I | May 4 | 1/2½ | 1/2½ | South East'n Gas Cn. Ld. Ord. | 26/—28/- | ... | 26/9—27/3 |
| 845,511 | I | Mar. 16 | -/10½ | -/10½ | Do. 4½ p.c. Red. Cum. Pref. | 21/—23/- | ... | ... |
| 200,000 | I | ,, | 4 | 4 | Do. 4 p.c. Cum. Pref. ... | 20 9—21/9 | ... | ... |
| 450,000 | Stk. | Feb. 17 | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 101—104 | ... | ... |
| 6,709,895 | ,, | Feb. 3 | 5 | 6½ | South Met. Ord. ... ... | 123—126 | ... | 123¾—125 |
| 1,135,812 | ,, | ,, | 6 | 6 | Do. 6 p.c. Irred. Pf.... | 145—150 | ... | ... |
| 850,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Irred. Pf.... | 104—107 | ... | 105¾—106½ |
| 1,895,445 | ,, | Dec. 16 | 3 | 3 | Do. 3 p.c. Deb. ... | 88—91 | ... | 88—89 |
| 1,000,000 | ,, | Jan. 6 | 5 | 5 | Do. 5 p.c. Red. Deb. | 114—117 | ... | ... |
| 1,543,795 | ,, | Feb. 3 | 6 | 6 | South Suburban Ord. 5 p.c.... | 131—136 | ... | 132½ |
| 512,825 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref.... | 122—127 | ... | 124½—125 |
| 500,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref.... | 103—108 | ... | 104½—106½ |
| 888,587 | ,, | June 8 | 5 | 5 | Do. 5 p.c. Deb.... | 121—126* | −2 | ... |
| 250,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb.... | 102—107* | −2 | ... |
| 427,859 | I | May 4 | 9½ | 1/2½ | S. Western Gas & Water Ord. | 22 6—23/6 | ... | ... |
| 160,523 | I | Apl. 20 | ... | -/10½ | Do. 4½% Red. Cum. Pref. | 21 9—22 9 | ... | 22/1½ |
| 110,000 | Stk. | Dec. 16 | 4 | 4 | Do. 4% Red. Deb. ... | 100—105 | ... | ... |
| 647,740 | ,, | Feb. 3 | 5 | 5 | Southampt'n Ord. 5 p.c. max. | 113—118 | ... | 118 |
| 121,275 | ,, | June 8 | 4 | 4 | Do. 4 p.c. Deb. | 100—105* | +2 | ... |
| 350,000 | ,, | Feb. 3 | 5½ | 5½ | Swansea 5½ p.c. Red. Pref. ... | 111—116 | ... | 114 |
| 106,000 | ,, | June 8 | 6½ | 6½ | Do. 6½ p.c. Red. Deb. ... | 98—101* | +1 | ... |
| 94,000 | ,, | ,, | ... | ... | Do. 3½ p.c. Red. Deb. ... | 95—100* | −1 | ... |
| 1,076,490 | ,, | Feb. 17 | 6½ | 6½ | Tottenham and District Ord. | 149—154 | ... | 153 |
| 409,835 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. Pref.... | 130—135 | ... | ... |
| 62,235 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 122—127 | ... | ... |
| 371,850 | ,, | June 8 | 4 | 4 | Do. 4 p.c. Deb. ... | 102—107* | −1 | ... |
| 369,774 | ,, | Feb. 3 | 7 | 7 | Uxbridge, &c., 5 p.c. ... | 153—158 | ... | ... |
| 108,330 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 122—127 | ... | ... |
| 1,340,521 | ,, | Feb. 3 | 7 | 7 | Wandsworth Consolidated ... | 158—163 | ... | 161—163 |
| 1,371,373 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 122—127 | ... | ... |
| 500,000 | ,, | ... | ... | ... | Do. 4 p.c. Pref. ... | 104½—106½ | ... | 105—105½ |
| 1,317,964 | ,, | June 8 | 5 | 5 | Do. 5 p.c. Deb. ... | 121—126* | −2 | ... |
| 338,300 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. ... | 103—108* | −1 | ... |
| 499,735 | ,, | Feb. 17 | 6½ | 7½ | Watford and St. Albans Ord. | 155—160 | ... | 157 |
| 200,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 120—125 | ... | ... |
| 200,000 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. Pref. ... | 133—138 | ... | ... |
| 200,000 | ,, | Dec. 2 | 4 | 4 | Do. 4 p.c. Red. Deb. | 100—105 | ... | ... |
| 100,000 | ,, | ,, | ... | 3½ | Do. 3½ p.c. Red. Deb. | 100—103 | ... | ... |
| 158,400 | ,, | Mar. 2 | 5 | 6b | Winchester W. & G. 5 p.c. Con. | 122—127 | +7 | 125½—126 |

a.—The quotation is per £1 of Stock. b.—Paid £3, including 10s. on account of back dividends. * Ex div.
† Paid free of income-tax. ‡ For year.

**Stock and Share List continued overleaf.**

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# STOCK AND SHARE LIST—Cont.

## Stocks Officially Quoted on Provincial Exchanges

| Issue. £ | Stock or Share | When ex-Dividend. | Dividends. Prev. Hf. Yr. % p.a. | Dividends. Last Hf. Yr. % p.a. | NAME. | Quotations. June 12. | Rise or Fall on Week. | Transactions, Lowest and Highest During the Week. |
|---|---|---|---|---|---|---|---|---|
| **BRISTOL EXCHANGE.** | | | | | | | | |
| 347,756 | Stk. | Feb. 3 | 5 | 6 | Bath Cons. ... ... ... | 124—126 | ... | ... |
| 1,667,250 | ,, | Feb. 17 | 5 | 5 | Bristol, 5 p.c. max. ... ... | 120—122 | ... | ... |
| 120,420 | ,, | June 8 | 4 | 4 | Do. 1st 4 p.c. Deb. ... | 101½—103½* | −1½ | ... |
| 217,870 | ,, | ,, | 4 | 4 | Do. 2nd 4 p.c. Deb. ... | 101½—103½* | −1½ | ... |
| 328,790 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... ... | 124—127* | −2 | ... |
| 274,000 | ,, | Feb. 17 | 5 | 5 | Newport (Mon.) 5 p.c. max.... | 111—116 | ... | ... |
| 13,200 | 12 | Mar. 16 | 7 | 8½ | Pontyp'l Gas & W. 10 p.c. 'A.' | 14—15 | ... | ... |
| 13,600 | 10 | ,, | 5 | 6 | Do. 7 p.c. B.' | 11½—12½ | +½ | ... |
| 40,000 | 10 | ,, | 5 | 6 | Do. 7 p.c. 'C.' | 11½—12½ | +½ | ... |
| 140,778 | Stk. | Feb. 17 | 5 | 5 | Weston-super-Mare Cons. ... | 113—115 | ... | ... |
| 64,338 | ,, | Dec. 16 | 4 | 4 | Do. 4 p.c. Deb. | 98—100 | ... | ... |
| 33,340 | ,, | ,, | 7½ | 7½ | Do. 7½ p.c. Deb. | 165—169 | ... | ... |
| **LIVERPOOL EXCHANGE.** | | | | | | | | |
| 157,150 | Stk. | Feb. 3 | 5 | 6½ | Chester 5 p.c. Ord. ... ... | 109—114 | ... | ... |
| 92,500 | ,, | June 8 | 4 | 4 | Do. 4 p.c. Pref. ... ... | 98½—103½* | −1½ | ... |
| 32,540 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. Deb. ... | 90—95* | −1 | ... |
| 41,890 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 98½—103½* | −1½ | ... |
| 2,167,410 | ,, | Feb. 17 | 6 | 6 | Liverpool 5 p.c. Ord. ... | 135—137 | ... | ... |
| 245,500 | ,, | Dec. 16 | 5 | 5 | Do. 5 p.c. Red. Pref. ... | 103—108 | ... | ... |
| 306,083 | ,, | Jan. 6 | 4 | 4 | Do. 4 p.c. Deb. ... | 105—107 | ... | ... |
| 106,280 | ,, | Feb. 3 | 10 | 10 | Preston 'A' 10 p.c. ... | 202—212 | ... | ... |
| 189,219 | ,, | ,, | 7 | 7 | Do. 'B' 7 p.c. ... ... | 140—150 | ... | ... |
| **NEWCASTLE EXCHANGE.** | | | | | | | | |
| 122,577 | Stk. | Mar. 2 | 8 | 8 | Blyth 5 p.c. Ord. ... ... | 154—156 | ... | ... |
| 732,000 | ,, | Feb. 3 | 5 | 5 | Hartlepool G. & W. Cn. & New | 117—119 | ... | ... |
| 2,061,315 | ,, | Feb. 3 | 5 | 5½ | Newcastle & Gateshead Con. | 26'—26'6a | ... | ... |
| 682,856 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... | 107—108 | ... | ... |
| 776,706 | ,, | Dec. 16 | 3½ | 3½ | Do. 3½ p.c. Deb. ... | 100—101 | −½ | ... |
| 277,285 | ,, | May 4 | 5 | 5 | Do. 5 p.c. Deb. '43... | 103—104 | ... | ... |
| 209,820 | ,, | Mar. 2 | 8½ | 8½ | South Shields Con. ... ... | 169—171 | ... | ... |
| 299,542 | ,, | Feb. 3 | 6 | 6 | Sunderland 6 p.c. max. ... | 129—131 | ... | ... |
| **NOTTINGHAM EXCHANGE.** | | | | | | | | |
| 542,270 | Stk. | Feb. 17 | 7 | 10 | Derby Con. ... ... ... | 176—186 | ... | ... |
| 55,000 | ,, | Dec. 16 | 4 | 4 | Do. 4 p.c. Deb. ... | 100—105 | ... | ... |
| 84,750 | ,, | Feb. 17 | 5 | 12 | Long Eaton 'A' Ord. ... | 175—185 | ... | ... |
| 50,000 | ,, | ,, | 4 | 10 | Do. 'B' Ord. ... | 130—140 | ... | ... |
| 20,000 | 10 | June 8 | 5 | 5 | Do. 5 p.c. Pref. ... | 10—12* | ... | ... |
| 80,000 | Stk. | ,, | 5 | 5 | Do. 5 p.c. Deb. ... | 117—122* | ... | ... |
| **SHEFFIELD EXCHANGE.** | | | | | | | | |
| 10,000 | Stk. | Feb. 17 | 10 | 10 | Great Grimsby 'A' Ord. ... | 220—230 | ... | ... |
| 6,500 | ,, | ,, | 10 | 10 | Do. 'B' Ord. ... | 220—230 | ... | ... |
| 79,000 | ,, | ,, | 10 | 10 | Do. 'C' Ord. ... | 205—215 | ... | ... |
| 1,806,339 | ,, | Feb. 17 | 6 | 6 | Sheffield Cons. ... ... | 146—148 | ... | ... |
| 95,000 | ,, | Dec. 16 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 100½—102½ | ... | ... |

a The quotation is per £1 of Stock.

## Supplementary List of Stocks and Shares not Officially Quoted

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 202,152 | Stk. | ... | ... | ... | Ascot Ord. ... ... ... | 119—124 | ... | ... |
| 128,182 | ,, | ... | ... | ... | Do. 5 p.c. Pref. ... ... | 117—122 | ... | ... |
| 238,631 | 1 | June 8 | 5 | 5 | Assd. Gas and Water Ord. ... | 21/—23/-* | −1/- | ... |
| 323,681 | 1 | ,, | 4½ | 4½ | Do. 4½ p.c. Cum. Pref. ... | 21/—23/-* | −/6 | ... |
| 150,000 | Stk. | ... | ... | ... | Do. 3½ p.c. Red. Deb. ... | ... | ... | ... |
| 17,000 | ,, | Feb. 17 | 8 | 8 | Bognor Orig. Ord. 'A' ... | 175—185 | ... | ... |
| 62,210 | ,, | ,, | 8 | 8 | Do. New Addl. 'A' ... | 175—185 | ... | ... |
| 87,160 | ,, | ,, | 7 | 7 | Do. New 7 p.c. max. ... | 145—150 | ... | ... |
| 37,440 | ,, | Feb. 3 | 10 | 10 | Cam.Univ. & Town 10 p.c.max. | 210—220 | ... | ... |
| 125,970 | ,, | ,, | 7 | 7 | Do. 7 p.c. max. ... ... | 158—163 | ... | ... |
| 39,025 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... ... | 108—113 | ... | 111½ |
| 65,000 | ,, | Mar. 2 | 7½ | 8½ | Eastbourne 'A' 5 p.c. ... | 170—175 | +10 | ... |
| 198,000 | ,, | ,, | 6 | 7 | Do. 'B' 3½ p.c. ... ... | 140—145 | +7 | ... |
| 112,312 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 120—125 | ... | ... |
| 130,000 | ,, | Dec. 16 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 122—127 | ... | ... |
| 250,000 | 1 | Nov. 18 | ... | 4 | Gas Consolidation Ord. ... | 20/6—22/6 | ... | ... |
| 250,000 | 1 | May 18 | 4 | 4 | Do. 4 p.c. Red. Cum. Pref. | 19/6—20/6 | ... | ... |
| 700,000 | Stk. | ... | ... | ... | Gas Light & Coke 3½ p.c. Rd. Db | 102½—104½ | +½ | 103½—104½ |
| 24,000 | 30 | Feb. 3 | 8½ | 8½ | Great Yarmouth 8½ p.c. max. | 52—57 | ... | ... |
| 59,400 | 30 | ,, | 7½ | 7½ | Do. 7½ p.c. max.... ... | 42—45 | ... | ... |
| 51,160 | Stk. | June 8 | 5½ | 5½ | Do. 5½ p.c. Deb.... ... | 123—128* | ... | ... |
| 152,600 | ,, | Mar. 2 | 8 | 8 | Guildford Cons. ... ... | 185—195 | ... | ... |
| 54,055 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 114—119 | ... | ... |
| 68,250 | ,, | June 8 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 120—125* | ... | ... |
| 156,600 | ,, | Feb. 3 | 7½ | 7½ | Hampton Court Cons. ... | 173—178 | ... | ... |
| 81,660 | 10 | Feb 4,'35 | 5 | 9 | Leatherhead Ord. ... ... | 16—17 | ... | ... |
| 107,960 | 10 | Mar. 16 | 4 | 5½ | Mid Kent Ord. ... ... | 10—11 | ... | ... |
| 230,940 | Stk. | Feb. 17 | 10 | 10 | Oxford & District Ord. ... | 210—220 | ... | 219½ |
| 47,112 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 118—123 | ... | ... |
| 50,000 | ,, | ,, | 6 | 6 | Do. 6 p.c. Red. Pref. ... | 113—118 | ... | ... |
| 126,193 | ,, | May 18 | 7½ | 7½ | Peterborough Ord. ... ... | 157—167 | ... | ... |
| 64,990 | ,, | Mar. 16 | 7½ | 7½ | Redditch Ord. ... ... | 113—118 | ... | ... |
| 166,850 | ,, | Feb. 17 | 7 | 9 | Romford Ord. ... ... | 170—180 | ... | ... |
| 60,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... ... | 97—100 | ... | ... |
| 44,000 | ,, | Mar. 16 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 120—125 | ... | ... |
| 10,950 | ,, | Mar. 2 | 8 | 8 | Ryde Ord. ... ... ... | 165—170 | ... | ... |
| 136,191 | ,, | Feb. 3 | 5 | 7 | Scarborough Ord. ... ... | 128—138 | ... | ... |
| 27,825 | ,, | Feb. 3 | 8 | 8 | Shanklin & Ventnor Cons. ... | 152—162 | ... | ... |
| 40,643 | ,, | Mar. 2 | 7 | 7 | Slough Ord. ... ... ... | 147—152 | ... | ... |
| 221,000 | ,, | Dec. 16 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 116—121 | ... | ... |
| 28,872 | 1 | May 4 | 5½ | 5½ | S. Midland Gas Cpn.Ltd. Ord. | 20/—22/- | ... | ... |
| 28,866 | 1 | Mar. 16 | 4½ | 4½ | Do. 4½ p.c. Red. Cum Pref. | 19/6—21/6 | ... | ... |
| 137,730 | Stk. | Feb. 17 | 7 | 7 | Southgate & Dist. 7 p.c. max. | 153—158 | +5 | ... |
| 62,500 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 115—120 | ... | ... |
| 117,228 | ,, | Mar. 2 | 5 | 6 | Swindon Cons. ... ... | 111—116 | ... | ... |
| 60,425 | ,, | Dec. 16 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 122—127 | ... | ... |
| 50,000 | 1 | Mar. 30 | ... | 5·52d. a | Utd. Kingdom Gas Cpn. Ord. | 20/6—22/6 | ... | 21/—21/7½ |
| 760,910 | 1 | ,, | 2½ | 2½ | Do. 4½ p.c. Prefd. Ord.... | 20/—22/- | ... | ... |
| 110,910 | 1 | May 18 | 2½ | 4½ | Do. 4½ p.c. Cum. Pref. ... | 21'—23/- | ... | 21/1½—21/9 |
| 900,000 | Stk. | Mar. 16 | ... | 3½ | Do. 3½ p.c. Red. Deb. ... | 98—101 | ... | 101½ |
| 130,000 | ,, | Feb. 3 | 5 | 8 | Wakefield Ord. ... ... | 140—145 | ... | ... |
| 81,650 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... ... | 105—110 | ... | ... |
| 82,000 | ,, | Feb. 3 | 6 | 6 | Weymouth Ord. ... ... | 106—111 | ... | ... |
| 98,384 | ,, | Feb. 3 | 6 | 6 | Wolverhampton 6 p.c. Pref. | 127—132 | ... | ... |
| 160,000 | ,, | June 8 | 5½ | 5½ | Do. 5½ p.c. Rd. Db | 107—112* | ... | ... |
| 370,000 | ,, | Feb. 3 | 4 | 6 | York Cons. ... ... ... | 107—112 | −1 | ... |
| 90,000 | ,, | Dec. 16 | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 103—108 | ... | ... |
| 133,640 | ,, | Feb. 3 | 6½ | 6½ | Yorktown (Cam.) 5 p.c. Cons. | 130—135 | ... | ... |
| 120,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 115—120 | ... | ... |
| 35,000 | ,, | Dec. 16 | 5½ | 5½ | Do. 5½ p.c. Deb.... ... | 130—135 | ... | ... |

a Actual.


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